

Smart Tourism Technologies for Destination Resilience: A Systematic Literature Review

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Abstract

In the post-pandemic era, tourism governance is shifting from reactive recovery to adaptive resilience. This study explores how Smart Tourism Technologies (STT) contribute to multidimensional destination resilience—economic, socio-cultural, and environmental. Using the PRISMA 2020 protocol, 28 empirical articles (2020–2025) from Scopus were systematically reviewed. To capture the intersection of rapid digital adoption and high crisis vulnerability, the review focused on empirical studies conducted in Asian destinations. Thematic analysis reveals a transition from short-term crisis response (2020–2021) to long-term systemic adaptation (2024–2025). STT supports resilience through three mechanisms: (1) Predictive Intelligence (AI and genetic algorithms) to optimize infrastructure; (2) Operational Agility (IoT and Blockchain) to enhance adaptability; and (3) Psychological Connectivity (service robotics and digital heritage) to rebuild trust. This study proposes the Smart-Resilient Destination Framework (SRDF), framing resilience as an interaction between algorithmic cognition and digital empathy. It introduces the concept of algorithmic antifragility, defined as the capability of smart destinations to continuously learn from crises, improve predictive capacity, and strengthen adaptive performance through data-driven feedback and intelligent system evolution.

Keywords: Smart Tourism Technologies; Destination Resilience; Crisis Management; Artificial Intelligence; Systematic Literature Review.

A. INTRODUCTION

The global tourism sector has long exemplified both immense economic significance and acute susceptibility to exogenous shocks. Over the past decade, it has endured a succession of unprecedented disruptions—most notably the systemic upheaval caused by the COVID-19 pandemic and the escalating threats associated with climate change and ecological instability (Hsu & Sharma, 2023; X. Wang et al., 2024). These crises have necessitated a paradigmatic reorientation in destination management, shifting from growth-oriented trajectories toward a more resilient paradigm centered on adaptive capacity and transformative recovery (Yoo et al., 2025; Zheng, 2025).

In navigating this volatile landscape, the integration of Smart Tourism Technologies (STT) has emerged as a pivotal enabler of destination resilience. STT encompasses the interconnected technological infrastructure that facilitates the collection, exchange, and intelligent processing of data to enhance both visitor experiences and managerial decision-making (Jin, 2025). The post-pandemic acceleration of digital transformation has foregrounded the strategic role of technologies such as Artificial Intelligence (AI), robotics, and Big Data analytics—not merely as instruments of efficiency but as mechanisms for safeguarding public health, reshaping traveler preferences, and predicting behavioral dynamics (Kim et al., 2021; Sung et al., 2020; Yu et al., 2023).

The notion of "smartness" in tourism has also evolved beyond metropolitan environments to encompass rural and niche destinations. Recent empirical evidence illustrates how STT contributes to local capacity building (Z.-A. A. Torabi et al., 2023) and enhances infrastructural resilience through intelligent public transit systems (Rapeepan Pitakaso et al., 2025). Emerging technologies such as Blockchain and the Internet of Things (IoT) further demonstrate the potential to optimize tourism supply chains, ensure data transparency, and safeguard cultural assets—thereby reinforcing the institutional, operational, and socio-cultural dimensions of destination resilience (Bin Bakri et al., 2023; He et al., 2024; Zheng, 2025).

Despite this growing corpus of research, current scholarship remains fragmented. Prior reviews have predominantly examined technology adoption or crisis management in isolation, or have focused narrowly on specific intersectional case studies without articulating a broader theoretical framework. More specifically, existing studies have primarily investigated individual Smart Tourism Technologies (STT)—such as Artificial

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Intelligence (AI), Big Data, Internet of Things (IoT), Blockchain, or service robotics—or have examined destination resilience from disaster management and recovery perspectives without systematically explaining how these technologies collectively operate across different stages of the crisis management cycle and reinforce multiple dimensions of destination resilience (Bin Bakri et al., 2023; He et al., 2024; Hsu & Sharma, 2023; Kim et al., 2021; X. Wang et al., 2024; Zheng, 2025). Furthermore, although recent studies acknowledge that resilience extends beyond operational recovery to include behavioral and psychological adaptation, the technological, operational, and psychological mechanisms have largely been discussed separately, resulting in the absence of an integrative conceptual framework that explains resilience as a dynamic, technology-enabled capability rather than merely a post-crisis outcome (W. Jia et al., 2023; Jin, 2025; M. Zhang & Song, 2023).

This research gap is particularly evident in the Asian context, where destinations simultaneously experience rapid digital transformation, high exposure to pandemics, climate-related hazards, and other systemic disruptions, while also serving as global leaders in smart tourism implementation (Hsu & Sharma, 2023; Yoo et al., 2025; Zheng, 2025). Although numerous empirical studies have investigated STT applications across Asian destinations, their findings remain dispersed across different technologies, resilience dimensions, and geographical settings, limiting cumulative theoretical understanding of how Smart Tourism Technologies interact to build destination resilience throughout the crisis management cycle (He et al., 2024; Jin, 2025; Nor et al., 2025; Z.-A. Torabi et al., 2023).

Consequently, a systematic synthesis is required to explicate the mechanisms through which digital transformation collectively fosters long-term adaptive capacity across multidimensional resilience—economic, social, and environmental. This review specifically focuses on the Asian context, defined by the empirical locations of the studied destinations rather than the authors' affiliations. This geographical delimitation is justified by the region's unique intersection of rapid digital technology adoption, high susceptibility to diverse systemic shocks, and proactive government-led smart tourism initiatives, providing a highly dynamic landscape for examining technology-driven resilience. By addressing these conceptual and empirical gaps, this review contributes beyond descriptive synthesis by developing the Smart-Resilient Destination Framework (SRDF). This integrative framework explains how Smart Tourism Technologies reinforce destination resilience through predictive intelligence, operational agility, and psychological connectivity, thereby extending current knowledge on technology-enabled resilience in tourism.

B. CONCEPTUAL FOUNDATION

The Digital Turn in Destination Resilience

Historically, destination resilience was understood as the ability of a tourism system to recover from disruptions such as natural disasters or economic crises. While foundational research on tourism crisis management and technological adoption existed well before 2020, the unprecedented scale of recent global shocks—most notably the COVID-19 pandemic—catalyzed a distinct paradigm shift and an accelerated wave of digital transformation. Consequently, the literature from 2021 to 2025 indicates a conceptual evolution toward adaptive and transformative resilience, emphasizing continuous learning, innovation, and systemic flexibility rather than a simple return to a pre-crisis equilibrium (Hsu & Sharma, 2023; Yoo et al., 2025). In this review, adaptive resilience refers to the capacity of destinations to adjust their operations and management practices in response to disruptions. In contrast, transformative resilience denotes the capability to reorganize tourism systems through innovation and fundamental institutional change. Building upon these perspectives, smart resilience is conceptualized as a technology-enabled form of resilience in which Smart Tourism Technologies (STT) enhance adaptive and transformative capacities through real-time data, intelligent decision-making, and digital connectivity (Hsu & Sharma, 2023; Jin, 2025; Yoo et al., 2025). In this paradigm, digitalization plays a pivotal role by embedding technological intelligence into risk anticipation, mitigation, and recovery processes. Resilience thus becomes a function not only of physical preparedness but also of digital connectivity and analytical capability.

Within this evolving landscape, Smart Tourism Technologies (STT) emerge as key enablers of resilience. Rather than representing a single technology, STT comprises an interconnected digital ecosystem in which multiple technologies operate synergistically to support destination preparedness, response, and recovery (He et al., 2024; Jin, 2025). Encompassing AI, Big Data, IoT, Blockchain, and robotics, STT facilitates real-time sensing, data-driven decision-making, and adaptive service delivery. Mobile interaction platforms, for instance, have

evolved from transactional tools into critical communication infrastructures that sustain tourist engagement during crises (Jin, 2025). Big Data analytics have proven indispensable for mapping behavioural volatility and mobility patterns, enabling Destination Management Organisations (DMOs) to recalibrate strategies in response to external shocks dynamically (Sung et al., 2020; Yu et al., 2023). Furthermore, the integration of Blockchain and IoT technologies has been explored to enhance transparency in resource allocation, secure digital assets, and protect heritage infrastructure (Bin Bakri et al., 2023; He et al., 2024).

Beyond urban centers, the notion of "smartness" now extends to peripheral and rural destinations. STT applications have supported local capacity building and the provision of resilient infrastructure, such as fuzzy-logic-based electric vehicle (EV) transit systems designed to ensure mobility continuity amid energy or environmental disruptions (Rapeepan Pitakaso et al., 2025). Collectively, these developments demonstrate that digital resilience extends beyond crisis response by embedding intelligent systems capable of anticipating risks, supporting adaptive decision-making, and strengthening long-term destination sustainability across multiple spatial scales (He et al., 2024; Rapeepan Pitakaso et al., 2025).

Human-Centric and Integrative Perspectives on Smart Resilience

While technological sophistication is indispensable, recent research underscores that the human dimension remains central to resilience-building (M. Zhang & Song, 2023). The effectiveness of smart systems ultimately hinges on how tourists and residents perceive, trust, and engage with them (Sung et al., 2020). During health crises, for example, service robots have been shown to reduce perceived risk and restore traveler confidence by ensuring hygienic interactions and service continuity (Kim et al., 2021). Similarly, immersive digital heritage technologies foster emotional connectivity and symbolic attachment, helping destinations sustain their cultural relevance and "psychological presence" even amid physical inaccessibility (W. Jia et al., 2023). These findings indicate that resilience encompasses both technological capability and human experience, highlighting the importance of trust, perceived safety, and emotional engagement as complementary dimensions of smart resilience (W. Jia et al., 2023; Kim et al., 2021; M. Zhang & Song, 2023).

Despite growing evidence of STT's transformative role, the literature remains fragmented and methodologically dispersed. Historically, research on smart tourism and destination resilience developed along parallel but isolated trajectories—the former focusing primarily on marketing, experience enhancement, and operational efficiency, while the latter concentrated on disaster recovery and vulnerability (Sun et al., 2022). Most contemporary studies explore discrete technologies in isolation—AI for predictive modeling (X. Wang et al., 2024), IoT for monitoring (Qi & Gao, 2022), or Big Data for analytics (Ho et al., 2023)—without articulating how these tools interact synergistically to create holistic, adaptive systems.

To fully realize the potential of these intersectional fields, there remains a critical need to bridge the divide between technological efficiency and human-centred outcomes, reconciling algorithmic optimization with behavioural and socio-emotional factors that shape long-term recovery and sustainability (Jin, 2025). This review addresses that gap by synthesizing recent scholarship to map the multidimensional mechanisms by which STT reinforces destination resilience across economic, social, and environmental dimensions. Rather than treating smart technologies as isolated operational tools, this review conceptualizes STT as an integrated socio-technical system that simultaneously supports predictive intelligence, operational adaptability, and human-centered resilience. This conceptual foundation provides the basis for the Smart-Resilient Destination Framework (SRDF) developed in the Discussion section, which synthesizes these interrelationships into an integrative theoretical model.

C. METHODS

This study adopts a Systematic Literature Review (SLR) design to synthesize contemporary scholarly discourse on the contribution of Smart Tourism Technologies (STT) to destination resilience. Following best practices for transparency, replicability, and methodological rigor, the review process adhered to the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page et al., 2021). A multi-stage screening protocol was implemented to identify a high-quality and thematically coherent corpus of literature. The systematic search was conducted in the Scopus database on 18 December 2025, as it provides comprehensive coverage of high-impact journals in tourism management, sustainability, and digital innovation. The search employed Boolean logic (AND, OR) to capture the intersection of three conceptual pillars: smart

technology, crisis/resilience management, and tourism. The search string applied was: ("smart tourism" OR "smart destination" OR "AI" OR "artificial intelligence" OR "big data" OR "internet of things" OR "IoT" OR "blockchain") AND ("resilience" OR "resiliency" OR "crisis" OR "disaster" OR "recovery" OR "vulnerability") AND ("tourism" OR "destination"). This process, applied to article titles, abstracts, and keywords, initially identified 780 records for preliminary screening. The selected keywords were intentionally designed to capture explicit Smart Tourism Technologies (STT) and resilience-related concepts that are directly aligned with the study objectives. Broader terms such as "digital transformation", "digital resilience", and "smart governance" were deliberately excluded because they encompass wider digitalization phenomena beyond tourism-specific technological applications, thereby reducing the specificity of the search strategy (Page et al., 2021).

To refine this pool, a structured inclusion–exclusion protocol was applied across four stages: First, Temporal Delimitation (2020–2025): While foundational research on both crisis management and digital tourism predates 2020, this specific temporal boundary was selected because the onset of the COVID-19 pandemic served as a profound structural break in the literature. It catalyzed a distinct paradigm shift, with STT transitioning from an optional marketing and efficiency enhancement to a mandatory resilience and public health infrastructure. Furthermore, despite typical publication lags, the exponential surge in crisis-related tourism research during this six-year window provides a theoretically saturated and highly relevant corpus representing this new digital-resilience paradigm ($n = 632$); 2) Document Type: To ensure scholarly rigor, only peer-reviewed journal and review articles were included; conference papers, book chapters, and non-scholarly works were excluded ($n = 171$). Second, Geographical Scope: The focus was restricted to studies empirically investigating destinations within the Asia-Pacific region, regardless of the authors' institutional affiliations. The region's unique duality justifies this conceptual filter: it is simultaneously a global epicenter of rapid smart technology and smart city deployment and a geographic zone highly vulnerable to diverse systemic shocks (e.g., pandemics, typhoons, earthquakes), providing an ideal laboratory for resilience-oriented innovation ($n = 63$). One comparative study conducted in Canada was retained during the final synthesis because it provided a theoretically relevant benchmark on technology-supported visitor spatial behavior, enabling comparison with resilience mechanisms identified across Asian destinations without altering the primary regional focus of the review; 4) Language Criterion: Only English-language publications were included for consistency in synthesis and interpretation. The overall review process is summarized in Figure 1 (PRISMA Flow Diagram).

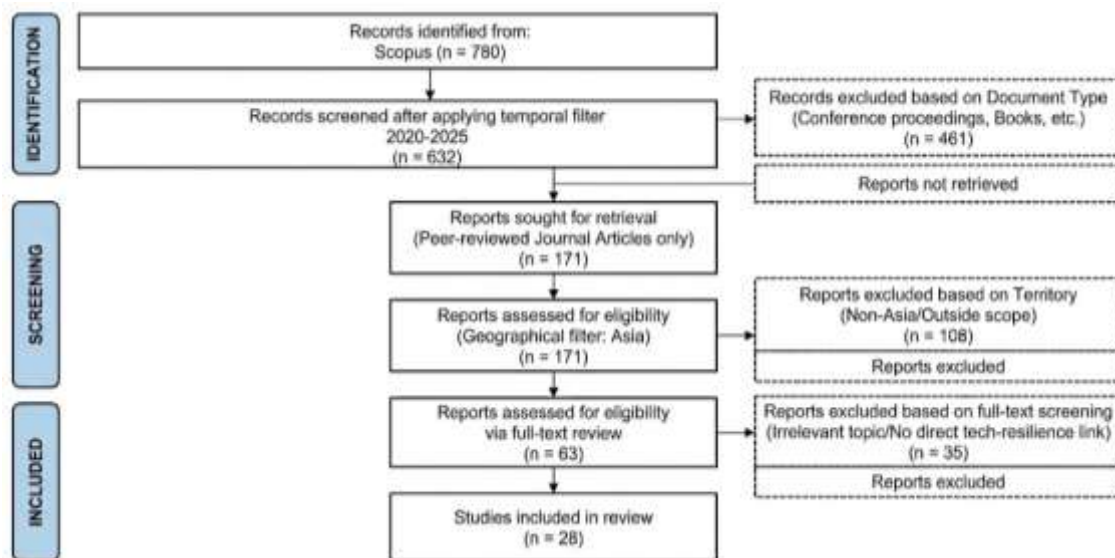


Figure 1. PRISMA Flow Diagram

Source: Research data, 2025

Subsequently, full-text screening ensured that each article explicitly examined the mechanisms through which STT contributes to destination resilience. Studies that addressed technology in general terms, without linking it to resilience dimensions, were excluded. Ultimately, 28 articles met all criteria and were retained for final synthesis. A standardized coding matrix was employed to extract key metadata, including authorship, year, geographic

focus, technological typology, targeted resilience dimensions, and principal findings. Two independent coders reviewed and coded all eligible studies independently. Any discrepancies in article selection, coding, or thematic classification were resolved through discussion and consensus until full agreement was achieved, thereby enhancing the credibility and consistency of the thematic synthesis. The extracted data were then analyzed using thematic synthesis, which enabled the identification of recurrent conceptual patterns, relational dynamics, and research gaps aligned with the study's research questions. The thematic synthesis followed an inductive analytical approach, in which recurring concepts, technological functions, and resilience outcomes emerged iteratively from the coded literature and were consolidated into higher-order thematic categories corresponding to the research questions.

While Scopus provides comprehensive coverage of high-impact publications, future studies may benefit from triangulation with complementary databases (e.g., Web of Science) to mitigate potential source bias and the overrepresentation of high-volume open-access journals in the dataset. To ensure robustness, all included articles were evaluated using identical inclusion criteria, coding procedures, and thematic synthesis protocols, ensuring that the final conceptual synthesis was driven by theoretical relevance and empirical quality rather than publication venue or journal prominence.

D. RESULTS AND DISCUSSIONS

The Landscape of Smart-Resilient Tourism Research

Before addressing the specific research questions regarding technological deployment and resilience mechanisms, a comprehensive content analysis of the 28 selected studies was undertaken to examine how Smart Tourism Technologies (STT) contribute to resilience across different stages of crisis management. The dataset reflects a regionally focused yet conceptually diverse body of scholarship, with twenty-seven studies situated within the Asian context—underscoring the region's accelerated digital transformation—and one comparative study from Canada (H. Wang et al., 2025) retained for global benchmarking of spatial visitor behavior. Overall, the literature reveals a clear evolutionary trajectory from reactive crisis response to proactive, systemic resilience-building. The temporal phases and thematic clusters presented below were derived inductively through thematic synthesis of the reviewed studies rather than being predetermined before data analysis, allowing the classification to emerge from recurring patterns in technological applications and resilience outcomes.

Temporal Evolution: From Survival to Transformation

The temporal distribution of the reviewed works (Table 1) illustrates a discernible shift in scholarly priorities between 2020 and 2025. The three developmental phases emerged inductively during the thematic synthesis as recurring patterns in research objectives, technological sophistication, and resilience orientation, rather than being established as an a priori analytical framework. This temporal progression is therefore not merely chronological but reflects the maturation of both the crises themselves and the technological capabilities deployed to manage them. Phase 1: Reactive Adaptation (2020–2021). The earliest phase primarily focused on short-term crisis mitigation in response to the COVID-19 pandemic. Studies in this period emphasized economic continuity and operational survival, exploring city branding resilience (Setiadi et al., 2021), the deployment of service robots for safety assurance (Kim et al., 2021), and the implications of mobility restrictions on visitation patterns (Sung et al., 2020; Wiguna, 2021).

Phase 2: Recovery and Optimization (2022–2023). As borders reopened, research attention shifted toward rebuilding trust and strengthening systemic capacities. Scholars investigated applications of IoT in environmental monitoring and forest safety (Qi & Gao, 2022), entrepreneurial recovery in rural contexts (Kang, 2022), and the psychological affordances of digital heritage experiences for post-crisis engagement (W. Jia et al., 2023; Z.-A. A. Torabi et al., 2023). Phase 3: Systemic Intelligence (2024–2025). The transition to this final phase is demarcated not by a specific event, but by a qualitative leap in technological sophistication. While 2022–2023 focused on optimizing existing systems (such as IoT) for recovery, research published from 2024 onwards reflects a mature stage of digital integration, characterized by the adoption of AI-driven modelling, Blockchain, and deep learning. Studies have advanced topics such as supply chain optimization using genetic algorithms (Zheng, 2025), spatial intelligence for sustainable urban recovery (Yoo et al., 2025), and algorithmic applications for epidemic prediction and smart transit systems (He et al., 2024; Rapepan Pitakaso et al., 2025).

Although the temporal boundaries between phases are necessarily approximate, the classification reflects the dominant thematic emphasis observed in each period rather than implying abrupt transitions. Several studies exhibit characteristics of multiple phases, illustrating the gradual evolution of Smart Tourism Technologies from reactive crisis management toward integrated resilience systems (He et al., 2024; Jin, 2025; Zheng, 2025).

Table 1. Temporal Distribution And Key Contributions Of The 28 Included Studies

Year	Count	Key Research Focus	Included Studies (Citations)
2025	7	Advanced AI, Supply Chain, Blue Urbanism, Rural Transit	(Zheng, 2025); (Hudayberdiev et al., 2025); (X. Wang et al., 2024); (Yoo et al., 2025); (Jin, 2025); (Nor et al., 2025); (R Pitakaso et al., 2025)
2024	3	Epidemic Prediction, IoT, Rural Spatiotemporal Analysis	(He et al., 2024); (X. Wang et al., 2024); (Yang et al., 2024)
2023	8	Climate Risk, Big Data Models, Tourist Mobility, Psychology	(Hsu & Sharma, 2023); (Bin Bakri et al., 2023); (Z.-A. Torabi et al., 2023); (W. Jia et al., 2023); (Ho et al., 2023); (Song & Xu, 2023); (M. Zhang & Song, 2023); (Yu et al., 2023)
2022	3	Entrepreneurship, Forest Safety, Crisis Approaches	(Sun et al., 2022); (Kang, 2022); (Qi & Gao, 2022)
2021	7	Pandemic Impact, City Branding, Low Carbon, Cultural IP	(Wiguna, 2021); (L. Zhang et al., 2021); (Lee & Hlee, 2021); (Kim et al., 2021); (Setiadi et al., 2021); (Bi & Wang, 2021); (Sung et al., 2020)

Source: Research data, 2025

Collectively, this temporal evolution underscores the field's intellectual progression from crisis-specific adaptation to strategic transformation, reflecting a broader paradigm shift toward digitally enabled resilience. Rather than representing discrete stages, these phases illustrate the progressive maturation of Smart Tourism Technologies, whereby technological innovations increasingly evolved from supporting immediate crisis response to enabling long-term adaptive and predictive resilience (He et al., 2024; Jin, 2025; Zheng, 2025).

Thematic Clusters: The Mechanisms of Resilience

To capture the conceptual diversity of the literature, the 28 studies were synthesized into four thematic clusters based on their dominant technological mechanisms and resilience outcomes (Table 2). These clusters collectively map the operational, social, behavioral, and predictive dimensions of smart resilience in tourism systems. The clustering was based on the dominant resilience function emphasized in each study rather than on the underlying technology itself. Consequently, the same technology may appear across multiple clusters because Smart Tourism Technologies frequently perform different functions depending on the resilience objective being addressed.

Table 2. Thematic Clustering of The 28 Smart-Resilience Studies

Thematic Cluster	Description	Representative Articles
Intelligent Supply Chain & Operations	Use of AI, Blockchain, and Algorithms to optimize logistics and reduce carbon footprint.	(Zheng, 2025); (He et al., 2024); (L. Zhang et al., 2021); (Bin Bakri et al., 2023); (Song & Xu, 2023)
Rural & Community Resilience	Digital interventions for capacity building, transport, and entrepreneurship in non-urban areas.	(Z.-A. Torabi et al., 2023); (R Pitakaso et al., 2025); (Nor et al., 2025); (Yang et al., 2024); (Kang, 2022); (Yoo et al., 2025)
Tourist Behavior & Psychology	Analysis of mobility, risk perception, and adoption of contactless/digital services.	(Kim et al., 2021); (Sung et al., 2020); (X. Wang et al., 2024); (Yu et al., 2023); (M. Zhang & Song, 2023); (T. Jia et al., 2023); (Jin, 2025)
Predictive Management & Safety	Leveraging Big Data, IoT, and Cloud to predict crises and manage destination safety.	(X. Wang et al., 2024); (Ho et al., 2023); (Hudayberdiev et al., 2025); (Qi & Gao, 2022); (Sun et al., 2022); (Wiguna, 2021); (Setiadi et al., 2021); (Bi & Wang, 2021); (Hsu & Sharma, 2023); (Lee & Hlee, 2021)

Source: Research data, 2025

First, Intelligent Supply Chain and Operations: This cluster focuses on optimizing tourism logistics, resource management, and environmental efficiency through advanced digital systems. Studies employing artificial intelligence, Blockchain, and algorithmic modeling highlight how technological intelligence minimizes disruptions and enhances sustainability during crises (Bin Bakri et al., 2023; He et al., 2024; Zheng, 2025). The defining characteristic of this cluster is its emphasis on optimizing operational continuity, resource allocation, and

organizational efficiency rather than on risk prediction or crisis surveillance. Second, Rural and Community Resilience: Several works emphasize the diffusion of smart technologies beyond urban centers to empower rural and peripheral communities. Through digital capacity-building initiatives, smart mobility solutions, and online entrepreneurship platforms, STT has been shown to enhance socio-economic resilience and bridge the urban–rural digital divide (Nor et al., 2025; Rapeepan Pitakaso et al., 2025; Z.-A. Torabi et al., 2023).

Third, Tourist Behaviour and Psychological Adaptation: Research in this cluster investigates the human–technology interface, highlighting how smart innovations shape risk perception, trust, and behavioural intentions. Studies demonstrate that contactless service robots, mobile applications, and digital heritage platforms mitigate anxiety and foster emotional continuity between tourists and destinations (T. Jia et al., 2023; Jin, 2025; Kim et al., 2021). Fourth, Predictive Management and Safety Systems: The final cluster conceptualizes STT as the analytical "brain" of destination management. Big Data analytics, IoT, and cloud computing are leveraged for crisis prediction, real-time monitoring, and safety governance. Unlike the previous cluster, the primary objective here is not operational optimization but early detection, risk anticipation, and evidence-based decision support through continuous monitoring and predictive analytics. This includes epidemic forecasting (X. Wang et al., 2024), digital branding strategies for reputation recovery (Setiadi et al., 2021), and smart monitoring infrastructures for environmental hazards (Hudayberdiev et al., 2025; Qi & Gao, 2022).

These clusters illustrate that smart resilience operates through multi-scalar mechanisms—ranging from micro-level behavioral adaptation to macro-level predictive intelligence. Because Smart Tourism Technologies are inherently multifunctional, several technologies—including Artificial Intelligence, Big Data, and IoT—appear across more than one thematic cluster. Their classification therefore reflects the dominant resilience function identified in each study rather than exclusive technological categorization. The synthesis reveals that the integration of technological, operational, and psychological dimensions is progressively shaping a holistic framework of smart destination resilience in the post-pandemic era.

Taxonomy of Technologies in the Crisis Management Cycle

Addressing the first research question (RQ1), this study classifies Smart Tourism Technologies (STT) identified in the reviewed literature according to their functional deployment within the three canonical phases of the crisis management cycle: preparedness and prevention, response, and recovery. The taxonomy was developed based on the dominant function performed by each technology within the reviewed studies rather than on exclusive technological categories. Consequently, several technologies appear across multiple crisis phases because their roles evolve alongside changing managerial priorities throughout the crisis management cycle. The analysis reveals a dynamic taxonomy in which certain technologies—such as Big Data analytics—demonstrate cross-phase ubiquity, while others, including robotics and Blockchain, exhibit phase-specific functions oriented toward crisis response and post-crisis transformation.

Preparedness and Prevention Phase: Building the Digital Shield

In the pre-crisis stage, technologies primarily serve predictive and preventive roles, fortifying destinations against potential disruptions. Two major streams dominate this phase: intelligent modeling and infrastructure hardening. First, Predictive Modeling: Advanced algorithmic systems have been utilized to anticipate and simulate disruptions, enabling proactive risk mitigation. (X. Wang et al., 2024) demonstrated the use of multi-feature AI models to predict epidemic trajectories, thereby facilitating timely interventions. Similarly, (Zheng, 2025) applied genetic algorithms to stress-test tourism supply chains, identifying structural vulnerabilities before crises occur. Second, Infrastructure Hardening: Blockchain and IoT are increasingly integrated to enhance systemic transparency and data security. (Bin Bakri et al., 2023; He et al., 2024) argue that decentralized ledgers strengthen transactional integrity and protect digital identities, minimizing systemic risk during cyber or financial shocks. In peripheral contexts, IoT-based sensor systems have been deployed as early-warning infrastructures for natural hazards in forest tourism, exemplifying how predictive technologies extend resilience into non-urban environments (Qi & Gao, 2022). Although AI, IoT, and Blockchain are also employed during later crisis stages, their primary contribution in the preparedness phase lies in strengthening predictive capability and infrastructural readiness before disruptions occur (Bin Bakri et al., 2023; He et al., 2024; Zheng, 2025).

Crisis Response Phase: Real-Time Monitoring and Mitigation

During the acute phase of a crisis, the focus shifts to real-time monitoring and minimizing physical risks. Big Data Analytics and Mobile Technologies emerge as the most critical tools in this stage. First, Mobility Tracking: The ability to track tourist movements in real time is vital for containment strategies. (Sung et al., 2020; Yu et al., 2023) utilized mobile signaling data and social media mining to map spatiotemporal changes in tourist behavior during outbreaks. This data enables Destination Management Organisations (DMOs) to manage crowd density dynamically (H. Wang et al., 2025). Second, Contactless Services: To mitigate health risks, robotics and automation have seen rapid adoption. (Kim et al., 2021) provided empirical evidence that service robots in hotels significantly reduced tourists' perceived health risks, thereby maintaining service continuity without compromising safety. Third, Emergency Communication: (Jin, 2025) highlighted the role of mobile interaction technologies as direct channels for disseminating emergency protocols to tourists, bridging the information gap that often exacerbates crisis impacts. In this phase, technologies previously used for prediction are reconfigured to support real-time operational decision-making, illustrating the adaptive and multifunctional nature of Smart Tourism Technologies across the crisis lifecycle (Jin, 2025; Sung et al., 2020; H. Wang et al., 2025).

Recovery and Transformation Phase: Rebuilding Trust and Capacity

In the post-crisis phase, technologies are employed to restore confidence, stimulate demand, and build long-term adaptive capacity. 1) Digital Heritage and Virtual Substitutes: When physical access remains restricted or psychological barriers persist, digital alternatives play a crucial role. (W. Jia et al., 2023) found that interactive digital heritage services help melt "psychological boundaries," fostering a continued emotional connection between the tourist and the destination; 2) Capacity Building in Marginalized Areas: The recovery phase also witnesses a focus on inclusivity. (Nor et al., 2025; Z.-A. Torabi et al., 2023) demonstrated how digital platforms empower rural communities and homestay operators to access the digital economy, diversifying their revenue streams and increasing economic resilience against future shocks; 3) Resilient Logistics: To support long-term operational recovery, (Rapeepan Pitakaso et al., 2025) proposed fuzzy-logic-enhanced public transit systems to ensure rural tourism remains accessible and sustainable even under resource constraints. Unlike the preceding phases, technological deployment during recovery emphasizes rebuilding confidence, strengthening community capacity, and promoting long-term destination transformation rather than immediate crisis mitigation (W. Jia et al., 2023; Nor et al., 2025; Rapeepan Pitakaso et al., 2025).

Table 3. Taxonomy of Smart Tourism Technologies across Crisis Management Stages

Crisis Phase	Primary Goal	Primary Technologies	Representative Functions in the Literature
Preparedness	Risk prediction and infrastructural reinforcement	AI algorithms, IoT, Blockchain	Supply chain stress-testing (Zheng, 2025); epidemic prediction (X. Wang et al., 2024); secure data infrastructure (He et al., 2024)
Response	Real-time monitoring and mitigation	Big Data, Mobile Tech, Robotics	Mobility tracking (Sung et al., 2020; Yu et al., 2023); contactless service delivery (Kim et al., 2021); emergency information dissemination (Jin, 2025)
Recovery	Trust rebuilding and adaptive capacity	Digital Platforms, VR/AR, Smart Logistics	Digital heritage engagement (W. Jia et al., 2023); rural digital entrepreneurship (Nor et al., 2025); resilient transit systems (Rapeepan Pitakaso et al., 2025)

Source: Research data, 2025

The taxonomy also highlights that Smart Tourism Technologies should not be interpreted as phase-exclusive innovations. Rather, their functions evolve throughout the crisis management cycle according to changing managerial priorities. For example, Artificial Intelligence supports predictive modeling during preparedness, facilitates data-driven decision-making during crisis response, and contributes to strategic optimization during recovery. Similarly, Big Data and IoT remain relevant across multiple phases, although their operational objectives shift from risk anticipation to real-time monitoring and eventually to adaptive planning. This functional overlap demonstrates that destination resilience depends not on individual technologies, but on their dynamic integration within an evolving smart tourism ecosystem (He et al., 2024; Jin, 2025; X. Wang et al., 2024; Zheng, 2025).

Mechanisms of Resilience Enhancement

Addressing the second research question (RQ2), this review synthesizes evidence to reveal the mechanisms through which Smart Tourism Technologies (STT) reinforce the multidimensional resilience of tourism destinations. The findings demonstrate that STT operates not as isolated technological tools but as systemic enablers that stabilize economic processes, strengthen community structures, and promote ecological adaptation throughout the crisis lifecycle. For analytical clarity, the identified mechanisms are organized into four interrelated resilience dimensions: economic, operational, social, and environmental. While these dimensions are conceptually distinct, they function synergistically through the integration of Smart Tourism Technologies across destination systems.

Economic and Operational Resilience

Economic resilience refers to Smart Tourism Technologies' (STT) capacity to sustain financial performance, diversify markets, and preserve business continuity during periods of disruption. In contrast, operational resilience concerns the ability of tourism systems to maintain critical functions, optimize resource allocation, and rapidly adapt operational processes under changing conditions. Economic resilience emerges from the capacity of smart systems to optimize operations, secure financial transactions, and diversify revenue streams. Recent studies highlight the pivotal role of algorithmic intelligence in sustaining tourism supply chains amid disruptions. For instance, (Zheng, 2025) developed a genetic algorithm that enables dynamic resource reallocation and maintains logistical continuity when critical nodes fail, while (L. Zhang et al., 2021) showed that low-carbon supply chain models supported by predictive analytics minimize costs and exposure to energy shocks. Complementing these efficiency gains, blockchain-based infrastructure enhances financial transparency and security. From an operational perspective, these technologies enhance system flexibility by enabling real-time coordination, dynamic resource allocation, and continuity of essential tourism services during disruptions, thereby reducing operational vulnerability independently of direct economic outcomes (He et al., 2024; Zheng, 2025).

(Bin Bakri et al., 2023; He et al., 2024) emphasized that decentralized ledgers safeguard transactions and ensure liquidity for small tourism enterprises even during systemic disruptions. Beyond maintaining operations, STT also fosters market diversification. (Lee & Hlee, 2021) found that smart tourism cities attract technology-oriented travelers and stimulate inter-regional spillover effects, while (Nor et al., 2025) demonstrated that digital platforms enable microentrepreneurs to expand into global markets. Collectively, these technological mechanisms establish a foundation for economic stability, transforming vulnerability into adaptive growth and innovation. At the same time, they strengthen operational resilience by ensuring that tourism systems remain functional, responsive, and able to maintain essential services throughout the crisis lifecycle, even under conditions of substantial uncertainty (He et al., 2024; Zheng, 2025).

Table 4. Economic and Operational Resilience facilitated by Smart Tourism Technologies

Resilience Dimension	Key Mechanism	Supporting Technology	Representative Studies
Economic	Supply Chain Optimization	Genetic Algorithms, AI	(Zheng, 2025) (L. Zhang et al., 2021)
	Transaction Security	Blockchain	(Bin Bakri et al., 2023); (He et al., 2024)
	Market Diversification	Digital Platforms	(Lee & Hlee, 2021); (Nor et al., 2025)
Social	Capacity Building	Knowledge Sharing Platforms	(Z.-A. Torabi et al., 2023)
	Cultural Continuity	Digital Heritage / VR	(W. Jia et al., 2023) (Bi & Wang, 2021)
	Entrepreneurial Support	AI Network Embedding	(Kang, 2022)
Environmental	Spatial Management	GIS, Big Data Spatial Analysis	(Yoo et al., 2025); (H. Wang et al., 2025)
	Hazard Monitoring	IoT Sensors	(Qi & Gao, 2022); (Hsu & Sharma, 2023)
	Sustainable Mobility	Fuzzy Logic / EV Systems	(Rapeepan Pitakaso et al., 2025)

Source: Research data, 2025

Operational resilience is primarily represented through supply chain optimization, transaction continuity, and resource coordination mechanisms, which collectively underpin economic resilience while maintaining destination functionality during crises (He et al., 2024; Zheng, 2025).

Social and Community Resilience

The social dimension of resilience reflects a community's capacity to learn, adapt, and preserve cultural identity during crises. Smart Tourism Technologies play a transformative role in strengthening these capacities by enhancing inclusivity, connectivity, and cultural continuity. (Z.-A. Torabi et al., 2023) illustrated how digital adoption in rural Iran expanded communities' absorptive capacity—their ability to acquire, interpret, and utilize knowledge to manage local crises—while (Nor et al., 2025) observed that digital platforms in Malaysia foster collaboration among homestay operators, enabling collective resource sharing and joint marketing. Technological mediation also contributes to cultural preservation. (Bi & Wang, 2021; W. Jia et al., 2023) demonstrated that digital heritage technologies facilitate the creation of "Cultural Intellectual Property" (Cultural IP), allowing communities to sustain and monetize intangible heritage even when physical tourism is suspended. In parallel, STT enhances entrepreneurial adaptation, as shown by (Kang, 2022), who found that AI-driven information networks improve young entrepreneurs' awareness of market trends and enable the establishment of resilient, technology-based tourism ventures. These studies collectively underscore that smart technologies not only enhance operational efficiency but also empower communities to maintain cohesion, creativity, and identity amid disruption.

Environmental and Spatial Resilience

The environmental dimension of resilience is increasingly salient in the era of overlapping ecological and public health crises. STT contributes to this dimension by enhancing spatial intelligence, monitoring ecological systems, and promoting sustainable mobility. (Yoo et al., 2025) introduced the concept of "Blue Urbanism," demonstrating how spatial data analytics support the harmonious coexistence of urban development and coastal ecosystem preservation in post-pandemic recovery planning. Similarly, (H. Wang et al., 2025) showed how spatial visitor data in Canadian national parks can be used to design dispersal strategies that reduce crowding while protecting biodiversity. The monitoring dimension of resilience is reinforced through IoT-based early warning systems, as highlighted by (Qi & Gao, 2022), who developed a sensor-based forest safety system to detect natural hazards such as fires and landslides, and by (Hsu & Sharma, 2023), who emphasized data-driven governance for environmental risk management. Finally, technological innovation in sustainable mobility further demonstrates STT's ecological contribution. (Rapeepan Pitakaso et al., 2025) proposed a fuzzy-logic-enhanced electric vehicle transit network that ensures accessibility to rural destinations while reducing carbon emissions, thereby aligning resilience with sustainability imperatives. Collectively, these studies reveal how STT facilitates the transition toward spatially intelligent and environmentally adaptive tourism ecosystems capable of withstanding and learning from systemic shocks.

The Human Side of Smart Resilience: Trust, Perception, and Behavior

While much of the extant literature has concentrated on the technical sophistication of smart systems, a destination's resilience ultimately hinges on the affective and cognitive responses of its visitors. Addressing the third research question (RQ3), this review underscores that Smart Tourism Technologies (STT) function as psychological mediators—not merely as tools that facilitate transactions or service delivery, but as mechanisms that shape trust, recalibrate perceived risk, and guide adaptive behavioral patterns in times of crisis. From a behavioral perspective, these findings suggest that technological adoption during crises extends beyond functional utility, influencing tourists' cognitive evaluations, emotional responses, and willingness to engage with destinations under conditions of uncertainty (Kim et al., 2021; M. Zhang & Song, 2023).

The most pronounced transformation between 2021 and 2025 concerns the role of technology in attenuating perceived health risks and reconstituting the foundations of trust. Before the pandemic, automation in hospitality was often viewed as a potential erosion of service quality and authenticity. However, post-pandemic studies reveal a paradigm shift in which automation itself becomes a trust-enabling mechanism. (Kim et al., 2021) provided empirical evidence that the deployment of service robots in hotels during health crises significantly enhanced tourists' perceptions of safety and hygiene reliability. The "human touch," once emblematic of personalized hospitality, was reframed as a potential vector of risk, thereby positioning automation as a form of technological empathy—a means through which destinations assure care, consistency, and safety without physical contact. Complementing this, (Song & Xu, 2023) demonstrated that data-driven safety evaluation systems employing neural networks enable destinations to communicate transparent, evidence-based risk assessments. Similarly, (M. Zhang & Song, 2023) found that when visitors perceive destinations as technologically equipped—with IoT-

enabled monitoring and Big Data analytics—their anxiety levels decrease, fostering greater confidence in travel decisions. In this sense, STT acts as both a "safety shield" and a "trust amplifier," reconstituting the psychological contract between tourists and destinations. This pattern is consistent with broader trust literature, which suggests that perceived competence, reliability, and transparency are fundamental antecedents of trust formation under conditions of uncertainty. In the context of smart tourism, digital technologies enhance these perceptions by providing consistent information, reducing ambiguity, and supporting evidence-based decision-making (Kim et al., 2021; Song & Xu, 2023; M. Zhang & Song, 2023).

Beyond mitigating fear, smart technologies also sustain emotional connectivity during prolonged travel restrictions. The notion of "melting psychological boundaries," as introduced by (W. Jia et al., 2023), captures how immersive digital heritage experiences reduce the psychological distance between tourists and destinations. Through interactive, sensory-rich platforms, destinations maintain their symbolic presence within the traveler's consciousness even in the absence of physical mobility. These virtual affordances, which transform spectators into participants, preserve a destination's mental market share and facilitate post-crisis recovery once mobility resumes. Parallel to this, (Setiadi et al., 2021) illustrated how continuous engagement through digital city branding and social media campaigns enabled destinations such as Yogyakarta to maintain narrative visibility, countering the "out of sight, out of mind" effect that often accompanies prolonged disruptions. Digital communication, therefore, becomes an act of resilience in itself—a form of narrative continuity that preserves a sense of place in the virtual realm. These findings indicate that trust is sustained not only through physical safety but also through continuous psychological engagement, enabling destinations to preserve visitor attachment even when direct interaction is temporarily disrupted (W. Jia et al., 2023; Setiadi et al., 2021).

The behavioral implications of smart resilience extend beyond perception and emotion to the transformation of tourist decision-making. The post-pandemic traveller has evolved into an informed, self-regulating actor, leveraging technological systems to minimize exposure and maximize safety. Rather than passively accepting digital innovations, tourists selectively adopt technologies that reduce uncertainty, enhance perceived safety, and improve travel convenience, suggesting that perceptions of technological usefulness and trustworthiness strongly influence behavioral adaptation (Jin, 2025; Kim et al., 2021; Sung et al., 2020).

(H. Wang et al., 2025), in their comparative analysis of Canadian national parks, they found that real-time spatial information led visitors to engage in self-dispersal, avoiding congested zones and adopting new spatial movement patterns. This "dispersed tourism" not only enhances individual safety but also supports environmental carrying capacity, aligning behavioral adaptation with ecological resilience. (Jin, 2025) observed that mobile interaction technologies have fundamentally altered consumption logics, encouraging contactless payments, self-service experiences, and algorithmically optimized itineraries. Likewise, (Sung et al., 2020) identified a post-crisis shift in Korean travelers' preferences toward outdoor, eco-friendly, and domestic tourism—patterns reinforced by social media sentiment and public health data. Collectively, these transformations indicate that STT are not passive enablers but behavioral architects that co-produce new norms of mobility, trust, and sustainability in the post-pandemic travel landscape. The synthesis further suggests that destination resilience increasingly depends on the reciprocal interaction between technological capability and visitor acceptance, in which trust serves as the critical psychological mechanism that translates digital innovation into adaptive tourist behaviour (Jin, 2025; Kim et al., 2021; M. Zhang & Song, 2023).

Discussion

Moving beyond the descriptive synthesis of the 28 reviewed studies, this section offers a conceptually grounded interpretation of the synthesized evidence on how Smart Tourism Technologies (STT) are redefining destination resilience. The following discussion is explicitly derived from the thematic patterns identified across the reviewed literature, linking the empirical findings presented in the Results section with broader theoretical implications for tourism resilience. The literature from 2020 to 2025 collectively signals a paradigm shift: resilience is no longer understood as the capacity to "bounce back" to a pre-crisis state, but rather as a dynamic, data-driven capability to "bounce forward" through algorithmic adaptability, systemic learning, and socio-technical evolution. In this sense, technology does not simply support recovery—it reconstitutes the very logic of resilience itself.

The Philosophical Shift: From linear Recovery to Algorithmic Antifragility

Traditional tourism crisis management has long been grounded in a linear temporal model—an event occurs, a response is initiated, and recovery is pursued. The synthesis of contemporary literature disrupts this linearity,

replacing it with a cyclical and predictive paradigm of algorithmic resilience. The integration of Artificial Intelligence, Big Data, and Blockchain enables destinations to move from retrospective analysis ("knowing what happened") to predictive foresight ("anticipating what will happen"), as evidenced by (X. Wang et al., 2024; Zheng, 2025). This epistemological shift introduces what can be termed algorithmic antifragility—a conceptual evolution of resilience wherein every crisis-generated data point feeds back into intelligent models, rendering the system progressively more adaptive and robust. In this review, algorithmic antifragility is defined as the capability of smart tourism destinations to improve their adaptive performance through continuous learning from crisis-generated data, whereby digital systems progressively strengthen prediction accuracy, operational responsiveness, and strategic decision-making after each disruption rather than merely restoring pre-crisis conditions (He et al., 2024; X. Wang et al., 2024; Zheng, 2025). Conceptually, algorithmic antifragility comprises three interrelated dimensions: (1) continuous learning through data feedback, (2) adaptive optimization of operational processes, and (3) progressive enhancement of predictive intelligence. Together, these dimensions distinguish algorithmic antifragility from conventional resilience, which primarily emphasizes recovery rather than improvement following disruption.

In this philosophical reorientation, resilience becomes less about resistance and more about intelligent evolution. The reviewed studies collectively suggest that destinations increasingly function as learning systems, where crisis-generated information is continuously integrated into managerial decision-making, operational redesign, and service innovation (He et al., 2024; Jin, 2025; Zheng, 2025). However, this transformation is not purely technological. The human dimension of resilience remains integral, albeit reconfigured through automation. (Kim et al., 2021) reveal an intriguing paradox in post-pandemic hospitality: the re-humanization of service through machines. In contexts of biological threat, robotic interfaces emerge not as replacements for human warmth but as guarantors of human safety—mediating trust, care, and emotional assurance. Thus, the convergence of human affect and machine precision marks the ontological threshold of the smart-resilient destination.

Conceptual Framework: The Smart-Resilient Destination Model (SRDF)

Drawing from this synthesis, the Smart-Resilient Destination Framework (SRDF) is proposed as an integrative conceptual model that explicates how technological antecedents are translated into multidimensional resilience outcomes under the catalyzing influence of crises. The framework (Figure 2) positions STT as both an infrastructural and a behavioral agent of transformation, bridging the technological, operational, and psychological dimensions of resilience.

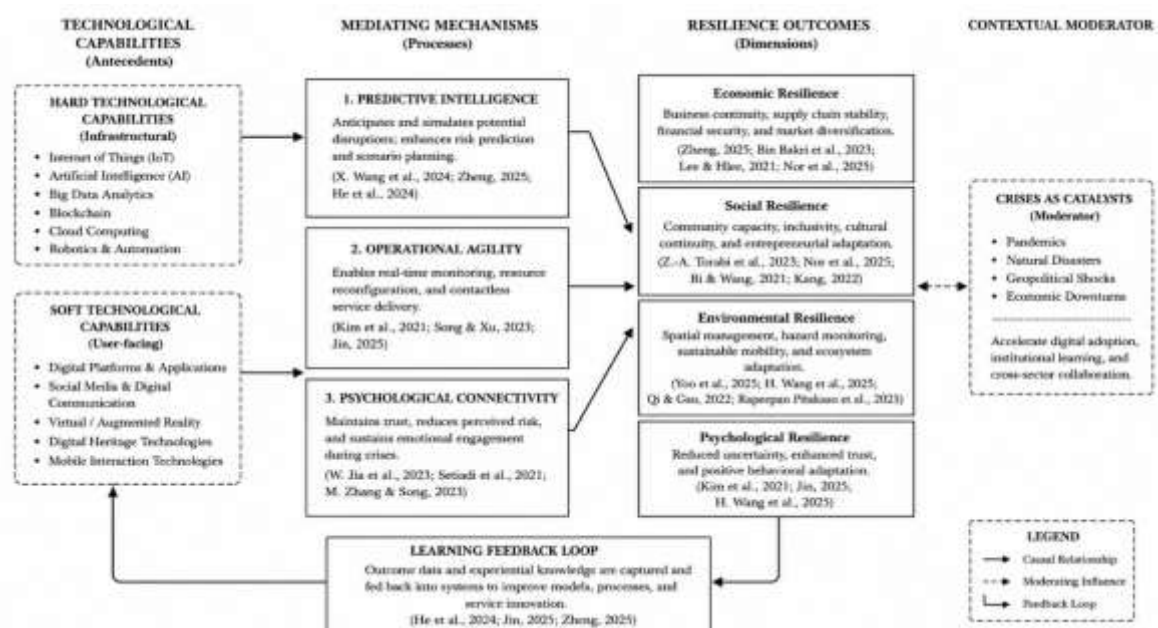


Figure 2. Conceptual Model Smart-Resilient Destination Framework (SRDF)

At its foundation, the model differentiates between hard and soft technological capabilities. Hard capabilities constitute the infrastructural backbone—such as IoT, Blockchain, and AI—that underpin operational efficiency, security, and predictive intelligence. These systems equip destinations with the analytical capacity to simulate potential disruptions, model alternative scenarios, and automate adaptive responses. Soft capabilities, by contrast, refer to user-facing technologies—such as virtual reality, social media platforms, and digital heritage applications—that sustain communication, empathy, and engagement during crises. These interfaces perform what (W. Jia et al., 2023) describes as the "melting of psychological boundaries," maintaining a sense of emotional continuity and relational trust when physical proximity becomes impossible.

The mediating mechanisms within the SRDF operate through three primary processes: predictive intelligence, operational agility, and psychological connectivity. Predictive intelligence enables anticipating disruptions before they occur, operational agility ensures the seamless reconfiguration of resources during shocks, and psychological connectivity preserves tourist trust and destination attachment amid uncertainty. Together, these mechanisms transform smart destinations into adaptive socio-technical systems capable of continuous self-correction and renewal. The relationships among these components are iterative rather than linear. Hard technological capabilities provide the infrastructural foundation for predictive intelligence and operational agility, while soft technological capabilities primarily reinforce psychological connectivity through communication and user engagement. These mediating mechanisms subsequently generate multidimensional resilience outcomes, which, in turn, produce new operational data and experiential knowledge. This feedback continuously enhances technological capabilities, creating a self-reinforcing cycle of learning and adaptation that characterizes smart destination resilience (He et al., 2024; W. Jia et al., 2023; Jin, 2025; Zheng, 2025).

The outcomes of these mediations manifest across multiple dimensions of resilience: economic continuity through stable supply chains and diversified markets; social inclusivity through the digital empowerment of rural and marginalized communities; environmental sustainability through spatial intelligence and crowd management; and psychological stability through reduced uncertainty and enhanced perceptions of safety. Importantly, the framework also conceptualizes crises as moderators rather than mere external threats. External shocks serve as catalysts, accelerating digital adoption, institutional learning, and cross-sectoral collaboration, converting technological potential into an existential necessity. In essence, the SRDF advances a theoretical synthesis in which resilience is not a static attribute but a dynamic equilibrium achieved through the co-evolution of human cognition and algorithmic intelligence. Unlike conventional linear resilience models, the SRDF conceptualizes destination resilience as a continuous feedback process in which technological learning, operational adaptation, and behavioral responses mutually reinforce one another over time. The smart destination thus emerges as a living, learning entity—one that transforms data into insight, disruption into design, and crisis into the precondition for future strength.

Future Research Agenda

To advance the scholarly discourse on technology-enabled destination resilience, future research must critically engage with the conceptual and empirical gaps identified across the 2020–2025 literature. While Smart Tourism Technologies (STT) have proven indispensable in building adaptive capacity, several dimensions remain underexplored—particularly those concerning ethics, technological evolution, and long-term sustainability. A pressing avenue for inquiry lies in the ethics of surveillance resilience. Current research overwhelmingly interprets data tracking and real-time monitoring through a utilitarian logic, equating surveillance with collective safety. However, this paradigm risks normalizing forms of technological intrusion that blur the boundary between protection and privacy violation. Future investigations should interrogate this tension by asking where the threshold lies between legitimate health monitoring and invasive control. Comparative and experimental studies could explore how tourists perceive this privacy–safety trade-off and whether heightened data visibility influences trust, loyalty, or destination image over time. Such research would deepen theoretical understanding of the moral and psychological underpinnings of digital governance in tourism resilience. Longitudinal surveys, discrete-choice experiments, and cross-cultural comparative studies would provide valuable evidence on tourists' privacy–safety trade-offs.

A second promising frontier concerns the transition from predictive analytics to generative intelligence. The reviewed literature primarily emphasizes predictive models that anticipate risk, yet the advent of Generative AI (GenAI) introduces a qualitatively new phase of algorithmic engagement. Future studies should examine how GenAI might extend beyond forecasting to deliver hyper-personalized, context-sensitive crisis communication and real-time itinerary adaptation. These applications could redefine psychological resilience by fostering a sense

of agency, reassurance, and emotional continuity among travelers. Conceptual models integrating GenAI with existing resilience frameworks—such as the Smart-Resilient Destination Framework (SRDF)—would contribute valuable insights into how anticipatory systems evolve into self-learning, empathic ecosystems. Future research may employ experimental designs, scenario-based simulations, and human–AI interaction studies to evaluate how GenAI influences trust formation, crisis communication effectiveness, and adaptive tourist behavior.

Finally, further investigation is required into the longitudinal viability of smart technologies in rural and resource-constrained contexts. While studies demonstrate that STT can enhance capacity and inclusivity in non-urban destinations, most current analyses remain cross-sectional and crisis-driven. Future research should adopt longitudinal and mixed-method approaches to assess whether these high-tech interventions remain functional, affordable, and socially embedded once initial funding dissipates or external shocks subside. Exploring the socio-technical sustainability of smart infrastructure over time will illuminate whether digital transformation genuinely contributes to structural resilience or merely produces short-term technological dependency. Longitudinal case studies, panel data analysis, and mixed-method evaluations are particularly recommended to assess the long-term institutional and socio-economic sustainability of smart technologies within rural destinations.

E. CONCLUSION

This systematic literature review concludes that Smart Tourism Technologies have evolved from auxiliary marketing tools into the critical central nervous system of destination resilience. In the post-pandemic Asian landscape, STT provides the essential capabilities for destinations to sense threats through data, process logistical responses with algorithms, and restore market confidence through digital connectivity. The primary theoretical contribution of this study is the Smart-Resilient Destination Framework (SRDF), which redefines resilience as a synergistic interplay between machinic intelligence (for operational antifragility) and digital empathy (for psychological stability). For practitioners and policymakers, the implication is unequivocal: digital transformation is no longer a strategic advantage but a fundamental prerequisite for survival in an era of perpetual uncertainty.

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