

ROBODESTINATIONS AND THE MANAGERIAL TRANSFORMATION OF SMART TOURISM IN THE ERA OF INDUSTRY 5.0

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Abstract: This study examines how robotics and artificial intelligence transform smart tourism into RoboDestinations. Findings show that human-robot collaboration enhances efficiency, safety, and personalization while introducing ethical and managerial challenges. The results highlight that successful implementation depends on balancing technological innovation with human-centered, sustainable, and responsible management.

Keywords: RoboDestinations, Smart Tourism, Industry 5.0, Service Robots, Tourism Management.

1. Introduction

The digital transformation of tourism has advanced far beyond the early phase of online information systems and booking platforms, evolving into comprehensive, data-driven ecosystems known as Smart Destinations. These environments integrate advanced technologies such as artificial intelligence (AI), big data analytics, and the Internet of Things (IoT) to enhance visitor experiences, optimize resource management, and support sustainable development [1]. As robotics and automation become increasingly sophisticated, the focus in tourism shifts from intelligent infrastructure to intelligent interaction.

The emergence of RoboDestinations illustrates this transition tourism environments where service robots, autonomous systems, and AI agents collaborate with humans to co-create experiences and improve operational efficiency. This trend is particularly evident in hospitality and cultural tourism, where robots function as concierges, guides, entertainers, and service assistants, contributing to seamless, personalized, and safe visitor journeys [2]. The COVID-19 pandemic further accelerated demand for automation, consolidating the role of service robots as tools of resilience and health security [3].

From a managerial perspective, RoboDestinations disrupt traditional models of leadership, workforce organization, and decision-making. Industry 5.0 reframes technology not as a replacement for human labor but as a collaborative partner that enhances creativity, empathy, and sustainability in service delivery. Within this framework, tourism managers must balance automation with human values, ensuring ethical governance, data protection, inclusiveness, and the preservation of authentic hospitality [4], [5].

The purpose of this paper is to conceptualize the managerial transformation of smart tourism in the context of robotics and AI, highlighting the implications for organizational strategy, service design, and ethical responsibility. By integrating recent international research, the article aims to deepen understanding of how RoboDestinations redefine tourism management in the

Industry 5.0 era, an era characterized by the convergence of efficiency, empathy, and technological sustainability.

2. Background and Literature Overview

The integration of digital technologies in cultural heritage management has grown remarkably in recent decades. As heritage sites face rising threats from climate change, overtourism, and structural decay, researchers and practitioners increasingly adopt advanced tools such as Digital Twins, 3D reconstruction, Geographic Information Systems (GIS), and augmented reality (AR) to support preservation and enhance accessibility. Tourism, historically one of the sectors most responsive to technological innovation, has transformed with each industrial revolution from mechanization to automation. The current stage, shaped by the Industry 5.0 paradigm, marks a shift from efficiency-driven digitalization to human-centered innovation, emphasizing collaboration between humans and intelligent machines. Within this context, robotics and artificial intelligence have become pivotal in redefining how value is created and managed in tourism ecosystems [6], [2].

The emergence of RoboDestinations builds upon the evolution of Smart Tourism Destinations (STDs), themselves derived from the broader Smart Cities framework. Artificial intelligence and automation technologies permeate all phases of the tourist experience from pre-trip planning to on-site activities and post-travel engagement. Intelligent automation enhances inspiration, information search, booking, and post-trip interaction through predictive analytics, personalization engines, and AI-driven interfaces such as chatbots and virtual assistants. On-site, robots and AI systems contribute to customer service, crowd management, and operational efficiency, forming the technological backbone of smart tourism ecosystems [7].

Recent studies highlight that AI reshapes hospitality and tourism by optimizing customer interaction, enhancing data-driven operations, and informing managerial decision-making [8]. Gretzel et al.

[9] emphasize that a smart destination integrates physical, digital, and social infrastructures through data analytics and connectivity to enhance sustainability and visitor satisfaction. Buhalis [1] further argues that smart tourism represents the convergence of information technology, experience design, and participatory governance, generating adaptive environments where tourists, businesses, and institutions interact dynamically. As the technological landscape matures, scholarly attention gradually shifts from connectivity and infrastructure toward automation and intelligent interaction, paving the way for RoboDestinations as the next stage of smart tourism.

Social robots defined by their ability to perform socially oriented tasks are increasingly deployed in hospitality, where they guide guests, facilitate reservations, and offer information. Their adoption aligns with theories of work specialization, enabling entrepreneurs and managers to leverage technological tools that enhance market responsiveness [4]. The integration of robotics is no longer speculative: Ivanov and Webster's global research [10] demonstrates a growing trend toward automating routine, dangerous, and repetitive "3D" tasks (dull, dirty, dangerous). Robots are mainly accepted for logistical operations such as cleaning, luggage handling, and information delivery, while high-empathy or judgment-based services remain predominantly human. Their findings reveal that consumers perceive robots as symbols of hygiene and modernity but prefer human interaction when emotional, creative, or safety-sensitive tasks are involved. This highlights the need for careful managerial orchestration to balance automation with human presence.

Hou, Zhang, and Li [11] add a psychological perspective by examining tourist-robot interaction through social crowding theory. Their results indicate that tourists in overcrowded environments are more willing to accept service robots, as these reduce social stress and perceived invasion of personal space. This has managerial relevance for destinations affected by overtourism: robots may not only enhance efficiency but also improve emotional comfort and safety.

The COVID-19 pandemic accelerated this trajectory. Rukumnuaykit, Pholphirul, and Phaphimolwat [3] show that post-pandemic adoption of service robots in Thailand was driven by health protection, labor stability, and business continuity. Although uptake remained modest, firm size strongly correlated with technological investment. While some displacement of unskilled labor occurred, new opportunities emerged in digital maintenance and AI system supervision. Their findings underscore that robotics act not as a threat to employment but as a catalyst for the transformation of the tourism workforce aligning with Industry 5.0's emphasis on human-machine synergy.

From a managerial standpoint, RoboDestinations require a reconceptualization of leadership. Using the Technology Acceptance Model (TAM), Skubis [4] finds

that perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of managers' willingness to adopt robotic technologies. Approximately 78% of surveyed managers recognized the potential of service robots for improving efficiency, brand differentiation, and customer satisfaction, while emphasizing the need for human oversight to maintain trust and service quality. These insights suggest that successful robotic integration depends not only on technological readiness but also on organizational culture and ethical governance.

The RAISA (Robotics, Artificial Intelligence, and Service Automation) framework proposed by Skubis, Mesjasz-Lech, and Nowakowska-Grunt [6] provides the most comprehensive theoretical model to understand these transformations. RAISA conceptualizes tourism operations as collaborative networks where humans and intelligent systems co-create value. Aligned with Industry 5.0's principle of human-machine "co-working," the model advocates that robots should handle repetitive, data-intensive tasks, while human employees focus on creativity, problem-solving, and emotional intelligence competencies that remain uniquely human. Destinations capable of achieving this balance are likely to achieve higher sustainability, operational efficiency, and visitor satisfaction.

The growth of robotics in tourism also raises ethical, cultural, and social considerations. Demir and Vatan [5] analyze the perceptions of human tour guides toward robot guides and reveal concerns related to dehumanization, cultural authenticity, and professional identity. Their results suggest that hybrid models, where human guides collaborate with robots, represent the most acceptable future direction, preserving narrative depth and emotional connection while leveraging technological precision. Ivanov and Webster [12] similarly emphasize that automation in hospitality must follow ethical and environmental principles. They argue that robotics should not only increase operational efficiency but also reduce environmental impact through energy-efficient design, sustainable materials, and responsible resource use.

A growing consensus in the literature emphasizes that RoboDestinations should not be viewed merely as technologically advanced spaces but as ethically responsible, socially inclusive ecosystems. They represent a transition from automation to augmentation, from efficiency to empathy, and from hierarchical management to collaborative leadership. Rather than replacing humans, RoboDestinations redefine tourism as a co-creative, adaptive, and ethically conscious experience.

3. Methodological Proposal and Case Study

Understanding RoboDestinations requires a methodological approach that bridges managerial science, robotics, and tourism studies within a coherent conceptual framework. The phenomenon is inherently interdisciplinary, involving not only technological innovation but also organizational transformation, ethical

reflection, and the redesign of human-machine interaction. Consequently, the research strategy adopted in this article is primarily qualitative, relying on conceptual synthesis, document analysis, and case study exploration to illuminate the managerial transformations emerging within roboticized tourism environments.

The first stage of analysis is grounded in an extensive review of international academic literature addressing robotics in tourism, smart destination management, and the socio-ethical dimensions of automation. Studies by Ivanov and Webster [12], Hou et al. [11], Florido-Benítez [2], Skubis et al. [6], and Rukumnuaykit et al. [3] collectively demonstrate that robotics is no longer a futuristic projection but a concrete managerial reality reshaping operational structures and visitor experiences. Insights from this literature provide the conceptual foundation for defining RoboDestinations as hybrid ecosystems in which human creativity, artificial intelligence, and sustainable management coexist and interact.

The theoretical orientation of this research follows the RAISA model, Robotics, Artificial Intelligence and Service Automation, proposed by Skubis, Mesjasz-Lech, and Nowakowska-Grunt [6], complemented by the human-centered paradigm of Industry 5.0. Together, these frameworks offer a robust basis for examining how tourism organizations integrate robotics into their strategic and operational practices. The Technology Acceptance Model (TAM) further supports this analysis by assessing how managers perceive the usefulness and ease of use of social robots. As shown in prior studies [4], TAM is effective in predicting behavioral intentions to adopt AI-based systems, making it a suitable lens through which to evaluate managerial readiness in RoboDestination environments. These frameworks underscore that destination transformation does not arise from technology alone, but from the dynamic interplay between digital systems, organizational leadership, and visitor engagement.

Additionally, the methodological model proposed by Kim et al. [8], which integrates practitioner insights, literature analysis, and expert perspectives through natural language processing, offers an expanded analytical structure for identifying AI-related trends in tourism management.

To contextualize these theoretical insights, this article adopts a qualitative case study approach focusing on the Henn-na Hotel in Nagasaki, Japan. Frequently described as the world's first fully robotic hotel, Henn-na represents a pioneering example of how robotics can be integrated into hospitality operations. Since opening in 2015, the hotel has employed a wide range of robots performing tasks traditionally reserved for human staff: reception, concierge services, room delivery, cleaning, and luggage handling. The case was selected because it exemplifies the operationalization of RoboDestination principles, highlighting both the potential and the

limitations of automation in real-world hospitality contexts.

Data for the case study were obtained through secondary sources, including corporate reports, academic publications, and prior empirical studies. Evidence indicates that the initial implementation of robots generated notable improvements in productivity and brand differentiation, drawing global attention and stimulating guest curiosity. Robotic systems reduced repetitive labor, enhanced hygiene standards, and demonstrated the feasibility of contactless service models an attribute that later became especially relevant in the post-pandemic landscape. However, operational realities also revealed challenges that complicate visions of full automation. Technical malfunctions, limited emotional intelligence, and the inability of robots to handle unstructured or unexpected guest requests exposed the vulnerabilities of a purely robotic service model. These functional limitations led management to reintroduce human staff in 2019, ultimately achieving a more effective balance between technological novelty and human flexibility.

From a managerial perspective, the Henn-na Hotel case illustrates that sustainable robotic adoption requires a hybrid leadership model that harmonizes algorithmic precision with human empathy. Robots excel at structured, data-intensive tasks, yet they still rely on human oversight for decision-making, exception handling, and relationship-building. Post-2019 adjustments at Henn-na align closely with the Industry 5.0 ideal, which envisions collaboration not substitution between human and intelligent agents. This adaptive organizational structure improved service reliability and reinforced customer trust, demonstrating that the future of tourism management lies in co-evolution between human and robotic actors.

The case also provides valuable insights into tourist perceptions of robotic service. Empirical observations from prior studies suggest that visitors initially view service robots as innovative, efficient, and entertaining, although enthusiasm often diminishes after the novelty effect subsides. Perceived usefulness, communication clarity, and emotional comfort become critical variables influencing long-term acceptance [11]. When robotic interfaces lack warmth, social presence, or adaptive responsiveness, guests may perceive the experience as impersonal, negatively affecting satisfaction and loyalty. Therefore, managerial innovation must consider not only technological performance but also the "humanization" of automation through design aesthetics, voice modulation, movement patterns, and AI algorithms capable of interpreting emotions or contextual cues.

Ethical and social implications emerge as equally important dimensions of robotic adoption. The deployment of service robots raises concerns related to data protection, surveillance, and labor restructuring. At Henn-na Hotel, extensive sensor networks and AI systems collect and process guest information, making data transparency, cybersecurity, and consent fundamental managerial priorities. Meanwhile, automation has

reconfigured the labor model: some low-skilled roles were reduced, while new positions emerged in system maintenance, programming, and digital supervision. As Rukumnuaykit et al. [3] note, such transformations necessitate continuous workforce development and upskilling initiatives to prevent social exclusion and ensure an equitable transition to digital hospitality.

The methodological design presented in this article can serve as a template for future empirical research on RoboDestinations. Combining conceptual synthesis with qualitative case study analysis enables a holistic understanding of how robotics redefines the tourism value chain. Future studies may expand this approach with mixed methods—quantitative surveys of managerial attitudes, visitor perceptions, and behavioral intentions, combined with qualitative interviews that capture lived experiences and ethical concerns. Comparative case studies across regions would also clarify cultural determinants of robot acceptance and illuminate diverse managerial strategies adopted in Asia, Europe, and the Americas.

Finally, the collaboration between humans and AI, including humanoid robots, has the potential to significantly improve tourism enterprise performance. By leveraging complementary strengths, organizations can reimagine managerial processes and enhance collaborative intelligence, redefining traditional leadership roles [6].

In summary, the methodological proposal and case study demonstrate how RoboDestinations redefine the managerial logic of smart tourism. They reveal the capacity of robotics to improve efficiency and innovation while reaffirming the irreplaceable role of human presence, empathy, and ethical responsibility. The Henn-na Hotel illustrates that technology alone cannot sustain competitive advantage; rather, it must be embedded within a holistic, human-centered vision. In this sense, RoboDestinations encapsulate the essence of Industry 5.0 an era in which technological intelligence and human consciousness converge to create more sustainable, inclusive, and emotionally resonant tourism experiences.

4. Conclusions

The evolution of tourism toward intelligent and automated forms of management represents one of the most profound transformations in the history of the service industry. The integration of robotics and artificial intelligence has redefined how destinations operate, how visitors experience hospitality, and how managers conceptualize efficiency, creativity, and ethics. Throughout this study, the transition from Smart Destinations to RoboDestinations has been presented not merely as a technological shift, but as a managerial and philosophical reorientation one in which human and artificial intelligence collaborate to create sustainable value.

The theoretical insights derived from the RAISA model and the Industry 5.0 paradigm demonstrate that the

future of tourism will be shaped not by automation alone, but by the ability of organizations to humanize technology and embed it within a culture of empathy and responsibility. The concept of a RoboDestination captures this balance by positioning robotics as a catalyst for innovation and sustainability rather than a substitute for human labor. The Henn-na Hotel case illustrates that technology reaches its highest value when integrated within a hybrid ecosystem that blends algorithmic precision with human intuition. The initial shortcomings and subsequent adjustments observed in this case show that the managerial transformation driven by robotics requires continuous learning, organizational flexibility, and ethical sensitivity.

From a managerial perspective, RoboDestinations necessitate a rethinking of traditional leadership models. Managers can no longer operate solely as coordinators of human teams; they must become orchestrators of human-machine collaboration. This expanded role requires competencies such as digital literacy, ethical reasoning, and the ability to interpret data within a human-centered decision-making framework. Leadership in roboticized environments must be guided by empathy, inclusiveness, and sustainability to ensure that technological innovation contributes positively to societal well-being. Organizations capable of integrating these principles will be better equipped to deliver personalized, emotionally engaging visitor experiences while maintaining operational excellence.

The adoption of robotics also transforms workforce management. While automation replaces certain routine tasks, it simultaneously creates opportunities for higher-skilled roles involving system supervision, technical maintenance, and data analysis. Tourism enterprises must therefore invest in training and continuous professional development to prepare employees for hybrid work environments. Fostering digital creativity and emotional intelligence among staff can transform resistance into engagement, turning workforce transformation into a driver of competitiveness rather than disruption.

Ethical governance emerges as a central pillar of responsible management in RoboDestinations. The extensive use of AI and service robots raises complex questions related to privacy, surveillance, algorithmic bias, and the emotional authenticity of service encounters. Managers must implement transparent data policies, establish clear accountability mechanisms, and ensure that automation respects the dignity of both employees and visitors. The Industry 5.0 perspective offers an essential ethical compass by emphasizing human-centric innovation that values emotional well-being and environmental harmony alongside operational and financial performance.

Sustainability constitutes another critical managerial dimension. As Ivanov and Webster [12] highlight, the implementation of robotics must consider ecological responsibility in addition to economic efficiency. Energy-efficient robots, recyclable materials, and low-carbon operational models are essential to align

tourism's digital transformation with global sustainability goals. This integration of technological and ecological ethics redefines destination competitiveness by linking innovation with environmental stewardship. At the same time, concerns related to data privacy, the digital divide, and algorithmic bias must be addressed to support the equitable and sustainable implementation of RoboDestinations [4].

More broadly, RoboDestinations reflect a paradigm shift in how value is co-created in tourism. Instead of treating visitors as passive consumers, intelligent destinations engage them as active participants in dynamic networks mediated by data and AI. Tourists contribute behavioral insights that continuously refine service quality. As the literature shows, satisfaction increasingly depends not only on functional performance but also on emotional connection and trust. Robots designed to simulate empathy, anticipate needs, and communicate transparently can therefore enhance both the symbolic and affective components of tourism experiences.

For academic research, this study opens several promising avenues. Future investigations may explore cross-cultural differences in the acceptance of service robots, conduct longitudinal studies on the economic and experiential impacts of robotic adoption, or compare fully automated and hybrid service models. Understanding how cultural values, age, and prior digital experience influence attitudes toward robots would further enrich this emerging field. Additionally, mixed-method approaches combining quantitative metrics with ethnographic insights could illuminate the nuanced interplay between technology and human experience in intelligent destinations.

As emphasized by Kim et al. [8], the sustainable future of tourism requires a balance between AI-driven efficiency, ethical governance, and human-centered service values.

In conclusion, the rise of RoboDestinations signifies a pivotal moment in the evolution of tourism management. It challenges scholars and practitioners to reconceptualize efficiency through the lens of empathy, to view automation as a collaborative partner rather than a threat, and to align innovation with ethical and ecological consciousness. Ultimately, the success of robotic integration will depend not on how many machines are deployed, but on how wisely they are managed and how meaningfully they contribute to human well-being. In the Industry 5.0 era, the true measure of progress in tourism will not be technological supremacy, but the ability to harmonize intelligent automation with authentic, meaningful, and sustainable human experiences.

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