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Abstract

Purpose: The hospitality sector is also experiencing significant digital change by embracing such Industry 4.0 technologies as Artificial Intelligence (AI), the Internet of Things (IoT), Big Data analytics, and robotics. The research aims to determine how these technologies are transforming hotel operations, customer experience, and the labor force, and identify gaps and challenges that inhibit effective implementation.

Methodology: The paper uses the qualitative literature review of scholarly articles and industry reports published recently to generalize the current knowledge, identify gaps, and suggest future areas of research.

Findings: The results indicate that AI and chatbots can improve personalization and overall efficiency of staff, yet provoke some ethical issues concerning bias, transparency, and multilingual dialog. IoT facilitates smart rooms, predictive maintenance, and energy efficiency, but it also presents serious security and privacy concerns. Big Data allows better revenue management and optimal services, although it comes at the cost of regulatory compliance (GDPR). The adoption of robotics can reduce or eliminate labor shortages and promote consistency in services. Still, it differs depending on the cultural context, with Japan having adopted automation to a larger degree compared to the United States. Nevertheless, some challenges remain, including the cost of implementation, uncertainty over ROI, loss of jobs, and the limited ability of SMEs to scale.

Unique Contribution to Theory, Practice and Policy: The study suggests a balanced approach to the implementation of Industry 4.0 in the hospitality sector, which will focus on the cost-benefit justification in terms of ROI case studies, data governance, ethical protection measures, and reskilling as part of the workforce adjustment process. Future studies need to look at longitudinal studies of technology outcomes, cross-cultural adoption strategies, and workforce integration frameworks.

Keywords: *Industry 4.0, Hospitality, Artificial Intelligence, Internet of Things, Big Data, Robotics, Digital Transformation, Workforce Reskilling, Data Privacy*

JEL Codes: *L83, O33, M15, Z32*

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INTRODUCTION

The Fourth Industrial Revolution which people call Industry 4.0 presently revolutionizes manufacturing operations worldwide and it affects the hospitality and tourism industries. The technological advancements behind Industry 4.0 bring new business operation methods through cyber-physical systems and the Internet of Things (IoT) as well as artificial intelligence (AI), big data analytics, and automation techniques (Kagermann, Wahlster, & Helbig, 2013). Many academic discussions address Industry 4.0 in manufacturing environments but scholarly investigation of its impact on hotels is still in progress (Liao et al., 2017; Schwab, 2024).

The hospitality industry experiences a continuous transformation of business procedures in hotel operations combined with guest services and marketing approaches (Buhalis & Amaranggana, 2015; Gretzel et al., 2015). The expanding use of automation together with AI customer support systems and smart technologies brings profitable prospects to the industry but creates massive implementation hurdles. Research into specific technologies that belong to Industry 4.0 within this context remains unclear together with guidelines for implementing them effectively in hospitality operations (Ivanov & Webster, 2017; Kuo et al., 2017). The investigation of how Industry 4.0 technologies affect hospitality staff and guest experiences remains incomplete because this transition might replace employees yet create more efficient systems that please customers.

Aims

The research aims to identify the most widely implemented Industry 4.0 technologies in the global hotel sector. This research analyzes recent publications by examining the impact that innovative systems, AI technology, and other Industry 4.0 means are making on the industry. The analysis will evaluate the technological frameworks alongside their related difficulties, including pricing obstacles and implementation hurdles, as well as possible workforce modifications. This review establishes a valuable understanding of present-day digital hospitality transformations by identifying important knowledge gaps while suggesting research paths for future work.

Problem Statement

Although digital transformation is an increasingly popular topic, most of the available literature lacks practical implementation frameworks, cost-benefit analyses, and workforce adaptation strategies in the hospitality industry. Current literature does not comprehensively discuss the ethical, privacy, and operational issues inherent in the adoption of AI and IoT in the hotel industry. The current paper aims to bridge those gaps by discussing the existing Industry 4.0 applications, assessing implementation challenges, and offering information on technology integration.

Methodology

Database Search and Article Selection

The database search on Google Scholar was initiated using “The integration of Industry 4.0 technologies in the hospitality sector” as the keyword, which produced an initial pool of 89,000 articles. The application of four-year publication date restrictions reduced the number of articles from 89,000 to 16,800. The use of Boolean operators for the search query "industry 4.0 technologies hospitality sector" cut down the number of articles from 16,800 to 32. The research included only peer-reviewed articles, which provided read-only access to their full text content.

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Inclusion and Exclusion Criteria

The researchers established particular criteria that maintained relevance to the subject matter. Articles were included if they:

- Focused on studying Industry 4.0 technological implementations in hospitality operations, which involve AI, IoT, big data, and automation systems.
- Published within the period from 2019 through 2023.
- Analyzed these studies, recipients needed access to their complete texts, and these papers had received scholarly reviews.
- Covered both advantages and drawbacks as well as practical applications of Industry 4.0 for hospitality operations, guest services, and workforce management.

Articles were excluded if they:

- Failed to discuss either Industry 4.0 itself or its specific technologies.
- Focus exclusively on sectors outside hospitality.
- Lacked proper methods for peer-review assurance and had insufficient methodological rigor.
- They were not fully accessible to conduct a detailed examination.

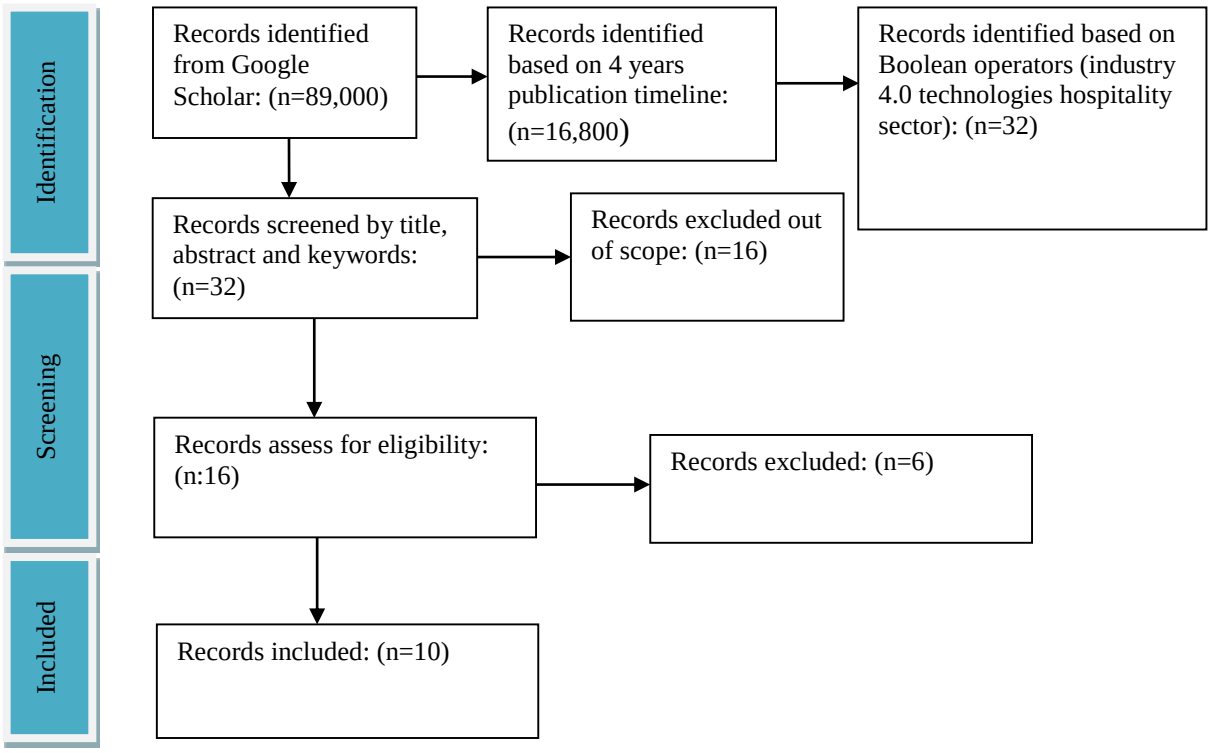

Figure 1: PRISMA Flow Diagram- Scholarly Search Process

Screening and Data Extraction

The research team judged 32 articles after reading their abstracts to determine their fit with the study question and methodological standards. A complete review was performed on articles sourced for their relevance regarding Industry 4.0 applications in hospitality environments. The remaining analyses included 10 articles because the study excluded investigations that failed to meet the established criteria.

Data Analysis

A qualitative assessment of the final 10 studies inspected their primary themes alongside methods, together with their results about Industry 4.0 technology implementation in hospitality services. The scientific works are organized according to their technological focus on AI, automation, or IoT, and their operational discussion of guest services, hotel management, and marketing, with an examination of identified benefits and challenges. A study based on comparison revealed various recurring themes and gaps that exist within the researched literature.

Limitations

A limitation exists in this review from neglecting non-peer-reviewed studies, combined with the restriction to articles from the last four years of publication. The search process covered a wide range, but some potentially significant pieces of literature might have been excluded because of database restrictions or limited search capabilities.

Explanation/Justification for Selecting the Sources

The sources selected for this study were based on relevance, diversity, and academic quality to give a comprehensive review of Industry 4.0 technology in the hospitality sector. Selecting the sources involved the use of specific keywords such as Industry 4.0 in hospitality, digital transformation of tourism, AI and IoT for hotels, and automation in services.

Inclusion criteria required sources to be conference papers, industry reports, or peer-reviewed articles after 2020, so as to obtain the latest information. Priority was provided to studies in technological innovation, operational efficiency, customer satisfaction, and finances. Exclusion criteria ruled out sources with no data, opinion-driven sources, or sources that spoke of other industries besides hospitality.

The screening process was also systematic, with a broad search in academic databases such as IEEE Xplore, ScienceDirect, Springer, and ProQuest being performed initially. Filtered articles were further examined and categorized based on their relevance to the topics of AI, IoT, blockchain, robotics, and big data in hospitality. A flowchart has been included to show the process of searching and screening to provide clarity and replicability.

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Systematic Analysis of Research Methods

Table 1: Systematic Analysis of Research Methods in Reviewed Studies

Study	Research Methodology	Strengths	Limitations
George & Mishra (2024)	Empirical study using case analysis of digital transformation in hospitality	Real-world case studies provide practical insights	Limited generalizability due to specific case selection
Singh et al. (2024)	Mixed-methods approach (quantitative surveys and qualitative interviews)	Combines statistical data with personal experiences for a holistic view	Potential bias in self-reported data
Flavián, Tussyadiah, & Orús (2024)	Conceptual framework and theoretical analysis of immersive technologies	Provides an in-depth theoretical foundation	Lacks empirical validation
Sumali et al. (2024)	Quantitative research using structured surveys and statistical analysis	Large dataset enhances reliability	Lacks longitudinal data for long-term insights
Volante (2025)	Qualitative study using interviews with front-line leaders in hospitality	Provides rich, detailed insights from industry professionals	Small sample size limits applicability to the broader hospitality sector
Alam (2023)	Secondary data analysis of Industry 4.0 adoption in Bangladesh	Uses extensive industry data for trend analysis	Lacks primary data collection for deeper validation
Ben Youssef & Zeqiri (2022)	Quantitative analysis using econometric modeling	Intense statistical rigor in findings	Limited consideration of qualitative aspects of adoption
Oliinyk et al. (2022)	Case study and survey-based research on digitalization in hospitality	Captures both operational and technological perspectives	Limited sample size and geographical scope
Abdurakhmanova et al. (2022)	Literature review and conceptual analysis of Industry 4.0 in tourism	Provides a broad overview of existing research	No empirical data or testing
Zeqiri, Dahmani, & Youssef (2020)	Mixed-methods study combining quantitative and qualitative research	Strong integration of different perspectives	Lacks region-specific considerations

Discussion

AI and Chatbots: Enabling Guest Personalization and Enhancing Customer Service

Chatbots and Artificial Intelligence (AI) are also revolutionizing how hospitality companies interact with guests. AI-powered systems like predictive analytics and chatbots allow hotels to provide services depending on the preferences and behavior of the guests. Through an understanding of guest interactions, AI can suggest customized offers like room upgrades, tailored meals, or activities in the vicinity, making the experience more personalized and fulfilling (Oliinyk et al., 2022). Chatbots, often rolled out through websites, mobile apps, or in-room equipment, offer guests instant, round-the-clock assistance for functions such as reservations, room service orders, or information queries. This automation makes the customer care process faster, reduces waiting times, and keeps guests at ease with timely responses.

AI systems also enhance the efficiency of operations by automating processes that were formerly time-consuming for human workers. For example, AI can manage repeat requests, reserve

bookings, and record guest preferences from one stay to the next, developing a seamless and memorable guest experience (Ivanov & Webster, 2019; Singh et al., 2024; Sumali et al., 2024; Flavián et al., 2024). Nevertheless, the implementation of an AI brings up significant ethical concerns such as algorithmic bias, the opacity of decision-making, and constraints of cross-linguistic communication, which may impact user satisfaction in international markets. Hotels need to make sure that AI recommendations are reasonable and do not pose any cultural inappropriateness, but also retain trust and transparency among guests.

IoT: Smart Rooms, Predictive Maintenance, and Energy Efficiency

One of the most promising technology innovations in hospitality is the Internet of Things (IoT), with both operational efficiency and improved guest experience offering. IoT enables the development of "smart rooms" in which guests can manage their environment—lighting, temperature, and entertainment—from their mobile device or in-room controller. This degree of personalization enables hotels to address the particular needs of each guest, making the guest's stay more enjoyable and memorable (Singh et al., 2024). IoT sensors can also be used to perform predictive maintenance of hotel equipment, warning staff of possible problems like HVAC system failure or plumbing issues before they become out of hand, reducing downtime as well as maintenance expenses. IoT also has a significant role to play in terms of enhancing energy efficiency. Automated devices can tweak the heating, cooling, and lighting systems by considering guest occupation or usage, which results in substantial energy efficiency (Alam, 2023). Although these are good, the adoption of IoT presents significant issues about security and privacy. Data gathered by smart devices about a guest could be weakened by hacking or misuse. To stay in line with the international data standards, hoteliers should adopt robust cybersecurity measures and a privacy policy that prevents the breach of sensitive data.

Big Data: Next-Generation Analytics and Optimization of Customer Behavior and Operations

Big Data analytics is a game-changing solution for the hospitality sector, providing insights into guest behavior, preferences, and operational inefficiencies. By processing vast amounts of guest data, such as booking patterns, expenditures, and reviews, hotels can gain a complete picture of their guests' requirements and shape their services appropriately (Ben Youssef & Zeqiri, 2022; Flavián et al., 2024; Sumali et al., 2024). This enables better revenue management through demand forecasting, dynamic pricing, and cross-selling or upselling. Hotels, for instance, can utilize predictive models to forecast periods of high demand and raise the rates of hotel rooms during such times in a bid to maximize revenue during peak periods. The hotels also face regulatory challenges, particularly in relation to data protection. The field of data privacy and, therefore, compliance with GDPR and other country-specific or regional data privacy laws is a fundamental aspect of collecting, storing, or analyzing information on guests. Not complying with these regulations may lead to legal fines and a damaged reputation.

Cloud Computing: Enabling Data Processing and Real-time Collaboration

Cloud computing is one of the industry 4.0 enablers in hospitality, and it provides real-time data processing, scalability, and better collaboration among establishments and departments. Cloud applications enable hospitality businesses to store, process, and analyze big data securely while

making the data accessible anywhere and at any time (Singh et al., 2024; Oliinyk et al., 2022; Zeqiri et al., 2020). This enables the staff at hotels to work in real-time since they can view and update guest information, monitor inventory, and control operations remotely, without being confined to a location. Cloud computing allows easy integration with other Industry 4.0 technologies. For example, IoT sensors in a hotel room can be integrated with an online management system so that employees can remotely monitor and control the room settings.

Blockchain: Improving Security and Transparency in Transactions

Blockchain technology, with which it is most notably associated, is increasingly being used in the hospitality sector because of its capacity to provide security and transparency in transactions. Through the provision of a decentralized, immutable ledger, blockchain guarantees that guest transactions like payments, reservations, and loyalty scheme activities are secure and transparent (Abdurakhmanova et al., 2022). This is particularly crucial in reducing the risks that come with data breaches and fraud, which are prevalent in the hospitality sector.

Moreover, blockchain can simplify restaurant reservation and payment procedures by minimizing the use of intermediaries like online travel agencies (OTAs). This minimizes both customers' and restaurant operators' transaction costs, thus enhancing profitability (Ben Youssef & Zeqiri, 2022; Zeqiri et al., 2020). The transparency of blockchain also allows customers to verify the validity of restaurant reviews and ensure that the services they book are what they require, which further builds customer-business trust.

Table 2: Key Themes

Theme	Relevant Studies (In-Text Citations Only)
AI and Chatbots in Hospitality	(Ivanov & Webster, 2019; Singh et al., 2024; Sumali et al., 2024)
IoT and Smart Rooms	(George & Mishra, 2024; Singh et al., 2024; Zeqiri et al., 2020)
Big Data in Hospitality	(Ben Youssef & Zeqiri, 2022; Flavián et al., 2024)
Cloud Computing in Hospitality	(Singh et al., 2024; Oliinyk et al., 2022) (Zeqiri et al., 2020)
Blockchain for Security and Transparency	(Ben Youssef & Zeqiri, 2022; (Abdurakhmanova et al., 2022)
Robotics in Service Automation	(Volante, 2025)

Robotics: Automated Delivery of Services

Robotics is revolutionizing service provision within the hospitality sector through the automation of services that have conventionally been offered by human employees. For instance, self-check-in kiosks, robot concierges, and automatic delivery of room service are increasingly being used in hotels globally (Volante, 2025). Not only do such robotic systems improve business efficiency, but they also elevate guest experiences through minimized waiting times and more convenient 24/7 service. Robotics can also reduce labor shortages, which have perennially been the Achilles' heel of the hospitality sector, particularly during peak seasons. As robots manage routine tasks such as check-ins, luggage, and housekeeping, human personnel are on hand to focus on higher-

value service tasks such as guest interactions and customized experiences. In addition to check-in and concierge, robotics is being utilized to include cleaning robots, kitchen automation, and automated supply systems. These program examples demonstrate the wide-reaching potential of robotics in streamlining processes and enhancing guest experience in various hotel operations.

FINDINGS

Strengths and Contributions of the Literature

Successful Examples of Industry 4.0 Technologies

Several hotels have been able to integrate Industry 4.0 technologies, i.e., Artificial Intelligence (AI) and automation, to improve guest experience. For instance, the implementation of AI-based concierge services, such as those used by the Yotel hotel chain, has been highly appreciated by guests. Yotel's AI-based virtual concierge, "Yobot," assists guests with check-in, baggage storage, and other facilities, providing a convenient and efficient service (Ivanov et al., 2017). In addition to enhancing guest satisfaction through timely and personalized services, this technology also reduces the required human labor to a minimum so that employees can focus on more complex activities. Again, by utilizing AI to manage room preferences and personalize services, the use of technology to enhance both operational efficiency as well as customer experience becomes evident.

Positive Relationship between Adoption of Technology and Customer Satisfaction

Various studies have explored the correlation between the adoption of Industry 4.0 technologies and customer satisfaction. For example, Buhalis and Amaranggana (2015) suggest through a study that integrating mobile applications and AI systems into hotel operations leads to considerable customer satisfaction. Mobile applications allow visitors to manage various aspects of their stay, such as booking, room service, and interaction with hotel staff, from their devices. The convenience aspect not only adds to the guest experience but also helps in the management of the growing demand for technology-driven services. Similarly, studies have confirmed that AI-driven personalization of guest experiences, for example, personalized dining, entertainment, and activity recommendations, have a significant positive impact on guest loyalty and satisfaction (Oliinyk et al., 2022).

Moreover, Big Data analysis facilitates meeting customer needs by examining guest behavior and preferences and providing extremely personalized services. Based on customer information, guests' requirements can be predicted, their stays can be made comfortable and personalized, and hence satisfaction will be enhanced and repeat reservations will increase (Flavián et al., 2024).

Increased Operational Effectiveness and Reduced Cost via Automation

Robotic process automation within the hospitality industry has been shown to exhibit significant enhancements in the effectiveness of operations and cost reduction. In one study by Ivanov and Webster (2017), robot concierges and self-check-in machines have been used in various hotels, and the findings showed that the technologies reduce labor costs while improving the speed and accuracy of services. Robotics allows hotels to conduct routine tasks, such as check-in, luggage handling, and room service delivery, efficiently, thus freeing human staff to take part in more personal interactions. The labor cost savings and reduction in human error, along with the quicker

speed of service delivery, automatically translate into operational efficiency and profitability for hospitality businesses (Alam, 2023).

Conclusion

Embracement of Industry 4.0 technologies is redefining the hospitality Industry by assisting in its efficiency, personalization, and service delivery. Although AI/chatbots facilitate similar, easier guest interactions, they come with ethical dilemmas like prejudice, transparency, and language constraints in the international markets. Inventions based on IoT, such as smart rooms and predictive maintenance, enhance convenience and operational reliability, but also pose significant security and privacy issues. Big Data analytics will improve revenue management and service optimization but must comply with GDPR to protect guest information. Robotics also moves bots beyond being concierges and finds applications in cleaning, kitchen operations, and inventory management, therefore, limiting labor shortages and enhancing the steady provision of services.

Nevertheless, there are significant problems. Costs of implementation, ROI uncertainty, disruption to the workforce, and the ability to scale solutions to small and medium-sized companies continue to be threats. Some hospitality companies have successfully used Industry 4.0 to enhance profitability and customer satisfaction, but other companies have not achieved the expected outcomes, highlighting the level of disparity in technological renewal.

Conclusively, the findings can indicate that the implementation of Industry 4.0 in hospitality must be balanced with the emphasis on innovation, efficiency, and ethical, regulatory, and workforce issues. Successful sustainable digital transformation will not solely rely on adopting technology, but also good planning, regulatory adherence, and workforce adjustment.

Limitations and Inconsistencies in Existing Research

Though the adoption of Industry 4.0 technologies in hospitality has been widely covered in extant literature, there are significant limitations and inconsistencies in previous research that may interfere with the validity and applicability of conclusions. One key issue is the conflicting findings regarding whether the adoption of these technologies would be expensive. Others argue that Industry 4.0 technologies, mainly in their initial stages, are linked to increased costs of doing business due to the substantial investment required for technology deployment, staff training, and integration. For instance, Ben Youssef and Zeqiri (2022) note that while automation and artificial intelligence have cost advantages in the long term, the upfront cost of acquiring, installing, and maintaining such technologies is daunting for small businesses. These early investments can generate resistance to new technology, specifically among SMEs with lower financial resources.

In contrast, however, several other studies, such as Singh et al. (2024) and Alam (2023), suggest that the return on Industry 4.0 technologies is many times greater than the investment, leading to significant cost savings from automation, predictive maintenance, and process efficiencies. The inconsistency between these findings and other research highlights the need for more robust, longer-term studies that look at the impact of these technologies on costs over the long term. It also suggests that the cost-benefit calculation is highly context-dependent, and it may vary based on the size of the firm, the state of the market, and the type of technologies being introduced. Another limitation of current studies is in methodology. Most of the studies rely on small sample sizes or short-run observational data that cannot capture the complete effect or trends of Industry

4.0 technologies over the long run. For example, case studies to examine the success of AI concierge services in a particular hotel chain may not be representative of the use of such technology in the global hospitality industry. Moreover, a lack of longitudinal studies means that there is limited information with which to assess the long-term impacts of such technologies on profitability, customer satisfaction, or operational efficiency.

Gaps Identified and Future Research Directions

Although many studies document short-term benefits, such as customer satisfaction or improved operational efficiencies, few studies examine the long-term viability of such benefits over the years. Future research can look at longitudinal analyses to track the long-term impact of technologies like AI, IoT, and automation on costs, profitability, and guest experience. This must also involve cost-benefit analyses, based on real ROI case studies within hospitality organizations, which are a little underrepresented in the literature. This kind of evidence would offer a more practical and accurate image of the financial value of Industry 4.0 adaptation.

Another significant gap is the effect of cross-cultural variations on Industry 4.0 technology embraced in global markets. Different markets will have varying challenges and benefits when embracing these technologies, depending on cultural orientations to technology, the regulatory environment, and customers' expectations. For example, Sumali et al. (2024) revealed in a study that the adoption and utilization of AI-based services may vary according to cultural values related to privacy and trust in automation. Such cross-cultural variance can be clearly observed in the case of robot adoption, where Japan led the way in testing the application of humanoids in hospitality through the Henn-na Hotel, which included the use of humanoids in the greeting, concierge and everyday entertainment of its guests. In contrast, the United States took a humbler approach to hospitality automation by restricting itself to more support-oriented services and roles, as opposed to adopting the complete service model of humanoid interaction used in Japan (Chen et al., 2023). Examination of such cross-cultural differences may help hospitality businesses develop more suitable technology adoption strategies for different markets.

Besides, there is no research into the ethical impacts of Industry 4.0 technologies, particularly on the exploitation of data-driven technologies such as AI and Big Data analytics. Data privacy and data security are becoming issues as firms collect large amounts of people's data from customers. Research examines the ethical concerns of gathering, warehousing, and utilizing data, and even biases that AI systems can potentially inject into decision-making and customer experience.

In future research, scholars need to explore the long-term implications of Industry 4.0 technology on operational costs and customer satisfaction, primarily through large-scale longitudinal studies. Studies must also focus on workforce reskilling opportunities and the problem of displacement, with viable theories of how the hospitality industry can simultaneously reskill its employees and incorporate automation. While automation and AI technologies take on more routine functions, research could consider how firms can support workers whose positions are being displaced, learning about the workforce's role in this technological revolution. Finally, considering the cultural factors that dictate new technology adoption will be critical in realizing how the markets of the world adopt digital transformation. This will help hospitality organizations formulate policies that are aligned with local settings and maximize the benefits of Industry 4.0 technologies.

REFERENCES

Abdurakhmanova, G. K., Astanakulov, O. T., Goyipnazarov, S. B., & Irmatova, A. B. (2022, December). Tourism 4.0: Opportunities for applying industry 4.0 technologies in tourism. In *Proceedings of the 6th International Conference on Future Networks & Distributed Systems* (pp. 33-38).

Alam, S. S. (2023). Industry 4.0: Challenges and Opportunities of Tourism and Hospitality Industry in Bangladesh. Pabna University of Science and Technology.

Ben Youssef, A., & Zeqiri, A. (2022). Hospitality industry 4.0 and climate change. *Circular Economy and Sustainability*, *2*(3), 1043-1063.

Buhalis, D., & Amaranggana, A. (2015). Smart tourism destinations enhancing tourism experience through personalisation of services. In *Information and communication technologies in tourism 2015: Proceedings of the international conference in Lugano, Switzerland, February 3-6, 2015* (pp. 377-389). Springer International Publishing.

Flavián, C., Tussyadiah, I. P., & Orús, C. (2024). How immersive technologies are redefining the customer journey. Guest editorial. *International Journal of Contemporary Hospitality Management*, *36*(11), 3557-3565.

George, R., & Mishra, V. P. (2024, September). Analysis and Impact of Digital Influence in Hospitality and Tourism Industry. In *2024 2nd International Conference on Sustaining Heritage: Embracing Technological Advancements (ICSH)* (pp. 41-45). IEEE.

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: foundations and developments. *Electronic markets*, *25*, 179-188.

Ivanov, S. H., & Webster, C. (2017). Adoption of robots, artificial intelligence and service automation by travel, tourism and hospitality companies–a cost-benefit analysis. *Artificial intelligence and service automation by travel, tourism and hospitality companies–a cost-benefit analysis*.

Kagermann, H., & Wahlster, W. (2022). Ten years of Industrie 4.0. *Sci*, *4*(3), 26.

Kuo, C. M., Chen, W. Y., Tseng, C. Y., & Kao, C. T. (2021). Developing a smart system with Industry 4.0 for customer dissatisfaction. *Industrial Management & Data Systems*, *121*(6), 1353-1374.

Liao, Y., Deschamps, F., Loures, E. D. F. R., & Ramos, L. F. P. (2017). Past, present and future of Industry 4.0-a systematic literature review and research agenda proposal. *International journal of production research*, *55*(12), 3609-3629.

Oliinyk, O., Krasovskyi, S., Vasylenko, O., Prykhod'ko, K., Pliuta, O., & Tonkykh, O. (2022). Digitalization of business processes in the hospitality industry. *Economic Affairs*, *67*(4s), 725-733.

Schwab, K. (2024). The Fourth Industrial Revolution: what it means, how to respond1. In *Handbook of research on strategic leadership in the Fourth Industrial Revolution* (pp. 29-34). Edward Elgar Publishing.

Singh, R., Gehlot, A., Akram, S. V., Thakur, A. K., Gupta, L. R., Priyadarshi, N., & Twala, B. (2024). Integration of advanced digital technologies in the hospitality industry: A technological approach towards sustainability. *Sustainable Engineering and Innovation*, *6*(1), 37-56.

Sumali, R. S., Iriani, T., Brata, M. A. A. D., Sugiarti, I., & Karmila, M. (2024). ANALYSIS OF THE IMPACT OF DIGITAL TECHNOLOGY ON HOTEL OPERATIONS AND MARKETING IN THE INDUSTRIAL ERA 4.0. *International Journal of Social Science*, *4*(4), 473-478.

Volante, S. M. (2025). *The Perspectives of Hospitality Front-Line Leaders on the Inclusion of Robotic Service*. Proquest

Zeqiri, A., Dahmani, M., & Youssef, A. B. (2020). Digitalization of the tourism industry: What are the impacts of the new wave of technologies. *Balkan economic review*, *2*, 63-82.