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Human-robot interactions: a systematic literature review and future research agenda for the experience economy

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Abstract

Human-robot interaction (HRI) is human-to-robot and robot-to-human communication and cooperation. HRI involves developing intuitive interfaces and communication methods by which humans and robots can collaborate safely and efficiently while creating a positive user experience and fostering companionship. The research on HRI has gained momentum in healthcare, education, retail, agriculture, and manufacturing. However, HRI has become strategically significant for the experience economy and service sectors due to technological, economic, and social factors. In light of this, it is necessary to provide a unified and integrated review of the literature to understand how HRI impacts employees, firms, customers, and the overall hospitality and tourism industry. The Theory-Context-Construct-methods (TCCM) framework developed by Paul and Rosado-Serrano (2019) has been used to explore dominant theories, contexts, important factors, and methods applied so far. The current review provides an in-depth analysis of the field, allowing practitioners and researchers to understand various facets of HRI and address potential challenges.

Keywords: human-robot interaction, service robots, travel, tourism, hospitality, TCCM

Introduction

Human-Robot Interactions (HRI) is a multidisciplinary field that involves the study, design, implementation, and evaluation of business processes and interactive systems involving humans and robots (Begum et al., 2025; Sun et al., 2025). However, travel, tourism, and hospitality (TTH) are some of the key industries where more collaboration and interaction of humans and robots are required, and HRI has become strategically significant for the experience economy and service sectors due to technological, economic, and social factors (Simon et al., 2020). The growing integration of service robots into the TTH sector marks a significant shift in how services are delivered and experienced (McCartney & McCartney, 2020). However, some researchers have also raised concerns about the robots' application in services, as the personal touch is missing during service delivery (Chi et al., 2023; Lu et al., 2021). Moreover, there is a fear that the rise of AI and robotics is a threat to working humans, as these applications are replacing humans (McCartney & McCartney, 2020). Furthermore, concerns such as the conscious threat to personal identity and negative feelings about replacing human staff are leading scholars to examine the overall robots' service to customers and employees (Parvez et al., 2022). Also, contemporary research has explored employee-related issues such as workplace loneliness, psychological empowerment (Liu et al., 2025), and excessive workloads due to insecurity and uncertainty (Fu, Zheng, & Wong, 2022).

This study aims to explore empirical evidence and theoretical perspectives on HRI in literature published from 2000 to 2025 and examine the challenges, benefits, and way forward. An aggregate of 103 articles from Scopus is selected for the systematic literature review. Hospitality and tourism customers have shown faith in service robots (Lu et al., 2021). Hence, this study critically examines the current body of knowledge to reconfirm the significance of HRI in the TTH businesses and attract more future exploration in this domain.

Table 1. Review published on HRI in the hospitality and tourism industry

Article Subject	Review Period and studies reviewed	Author	Review method	Review focus	Research Objective
"Diving into the technology: A systematic literature review on strategic use of chatbots in hospitality service encounters"	2016-2023; 47	(Sam & Jasim, 2025)	Systematic literature review	Strategic, technological, and guest interaction aspects of chatbot use	Identify key strategies and frameworks for chatbot adoption in hospitality
"Working with service robots? A systematic literature review of hospitality employees' perspectives"	2000-2022; 29	(J. Xu et al., 2023)	Systematic literature review	Employees' perspectives on service robot use	Synthesize research on employee experiences and utilization of service robots
"How does the tourism and hospitality industry use Artificial intelligence? A review of empirical studies and future research agenda"	1989-2022; 102	(Saydam et al., 2022)	Bibliometric analysis and thematic analysis	Views on AI in tourism and hospitality.	Examine key themes, clusters, and scholarly trends in AI adoption
"A review of research into automation in tourism: Launching the Annals of Tourism Research Curated Collection on Artificial Intelligence and Robotics in Tourism"	2015-2020; NA	(Tussyadiah, 2020)	Systematic literature review	AI integration in tourism automation.	Analyze AI's role and integration in tourish technologies

Methodology

This review provides a detailed analysis of the literature to explore the existing awareness and gaps in the category of human-robotic interaction in hospitality and tourism. The TCCM-based review methodology is well established because it is a transparent, systematic, and replicable process. The keywords used for identifying relevant HRI literature in hospitality and tourism included terms such as 'human-robotic interaction', 'service robot', 'robotic assistant', 'AI-based chatbots', and sector-specific terms like 'hotel', 'tourism', 'restaurant', and 'spa', following previous studies (Rasheed et al., 2023; Fang et al., 2023). The key concepts in hospitality and tourism were identified based on the keywords hospitality, tourist, tourism, travel, trip, destination, hotel, spa, and restaurant. This ensures the final corpus addresses HRI within the core context of TTH industries. The Scopus database was utilized to collect the relevant literature on HRI

in the TTH sector based on predefined keyword concept categories relevant to hospitality and HRI. Scopus is a comprehensive database that offers a wide coverage of studies related to TTH (Begum et al., 2025). The articles and journals have been selected for the review based on the search criteria illustrated in Figure 1 as well as the inclusion process for this systematic study that follows the data collection process.

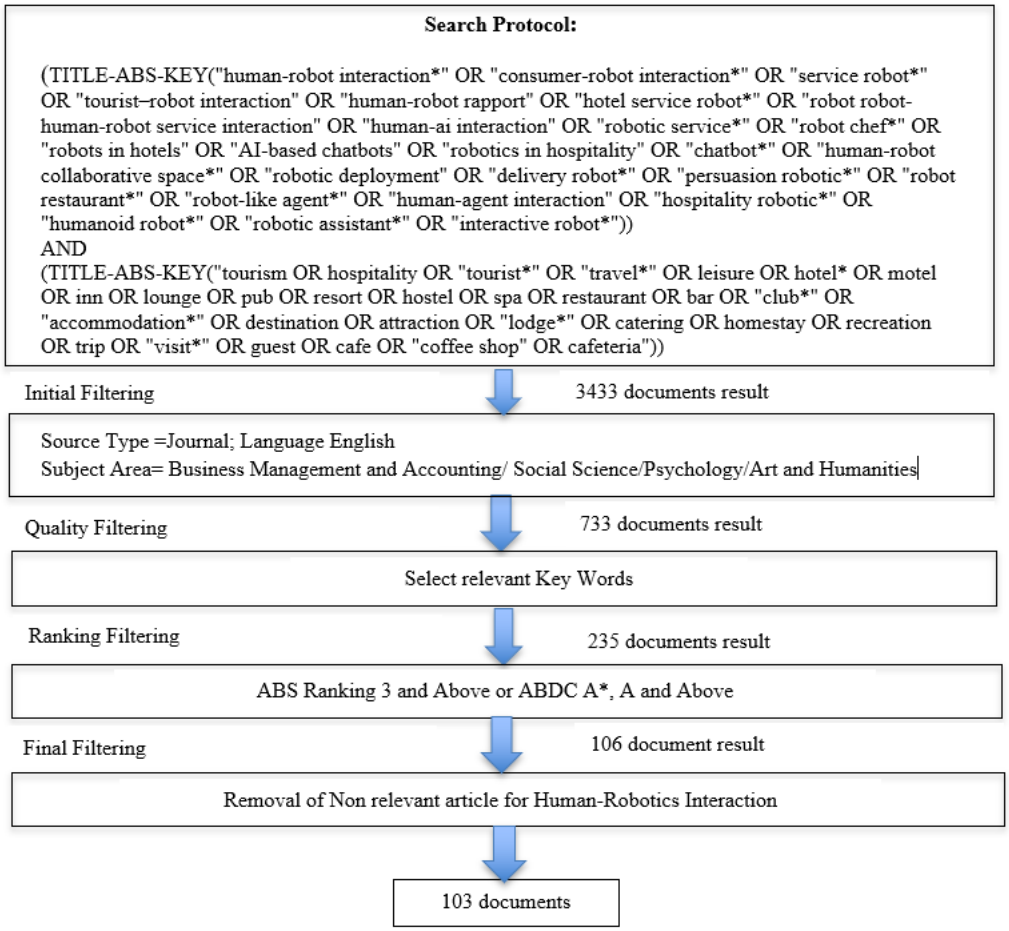

Figure 1. Selection of relevant articles

TCCM Framework for Systematic Literature Review

The TCCM framework-based analysis enables researchers to identify, analyze, and report the main theories used, constructs, and methods. This framework guides exploring new topics and concepts for future research by analysis of the existing theories, research methods, constructs of research, and contexts of research (Paul et al., 2021). The current literature analysis is based on the TCCM framework, as this framework is the most adopted. TCCM facilitates understanding of the deeper conceptualization and technology adoption in HRI.

The focus of the study is on HRI's impact on the business of tourism and hospitality and its advantages and challenges. In the next subsections of this study, we report the theoretical underpinnings, characteristics (key constructs such as independent and dependent variables, moderators, and mediators), contextual factors, and methodological diversity in HRI research.

Theoretical perspectives

A thorough exploration of existing theories provides a comprehensive understanding of the theoretical underpinnings related to a domain. This also fosters evaluating the strengths and limitations of various theoretical frameworks adapted in the extant literature, and potentially developing new hypotheses. Hence, based on the selection criteria, the selected 103 articles were analyzed to discover the well-grounded and relevant theoretical underpinnings. HRI research has employed multiple theoretical frameworks. The details of the adopted theories are given below in Table 4. Most of the theories are not very frequent and have not been used in more than 1 article. Therefore, the most frequently used theories are explored and explained in the next subsections.

Table 2. Adopted theories in HRI research

Theory	No of articles	Exemplary Article
Technology Acceptance Model (TAM)	24	(Chuah et al., 2022; van Esch et al., 2022; Xu et al., 2023 & Han et al., 2025)
Unified Theory of Acceptance and Use of Technology (UTAUT)	13	(Belanche et al., 2021; Xu et al., 2023)
Appraisal Theory	5	(Chuah et al., 2022; Xu et al., 2023)(Pitardi et al., 2024)
Theory of Planned Behavior (TPB)	4	(Chuah et al., 2022)
Technology Affordance Theory	2	(Leung et al., 2023; Vatan & Dogan, 2021)
Social Identity Theory	2	(Singh et al., 2021; van Esch et al., 2022)
Grounded Theory	2	(Fu et al., 2022; Fusté-Forné, 2021)
Product Level Theory	2	(Ma et al., 2022; Song et al., 2022)
Protection Motivation Theory (PMT)	2	(Chuah et al., 2022)

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was introduced by Fred Davis in 1989, explaining the roles of perceived usefulness and ease of use in predicting acceptance of a particular technology at an individual level. The individual-level construct known as behavioral intention (BI) leads the user to utilize the new technology. The user attitude (A) impacts the behaviour intention; it is a core technology impression. Fred Davis described the perceived usefulness (PU) as "the degree to which a person believes that using a specific system would enhance their work performance". TAM is utilized mostly in HRI technology adoption (Chuah et al., 2022; Xu et al., 2023), and it motivates the customer's willingness to experience and pay for the service robot (Mishra et al., 2023; Zhang et al., 2022). In the digital age, TAM has been used to identify the link between the digital system and user acceptance (Kang et al., 2022). TAM is the most explored theory employed in the HRI (24 studies out of 103) in TTH, and it is used at the user, consumer, and co-worker levels (Li et al., 2021).

Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh, Morris, Davis, and Davis (2003) established the UTAUT model ("User Acceptance of Information Technology: Toward a Unified View"). The acceptance of technology is verified by the theory, determined by effect expectancy, performance, facilitating conditions, and social influence. The initial three constructs provide the behavior and usage intention, and the final one is a direct determinant of experience. The user's behavior, age, gender, and voluntariness of use are pointed to moderate the effect of the key elements on usage intention and behavior. The theory was established through analysis and review of the eight models constructs where previous research had utilized to explain the system and usage behavior ("Theory of reasoned action, Technology acceptance model, motivation model, theory of planned behavior, a combined theory of planned behavior /technology acceptance model, model of personal computer use, diffusion of innovations theory, and social cognitive theory"). UTAUT has been employed in HRI in

hospitality and tourism in service enhancement (Belanche et al., 2021; Xu et al., 2023). The theory creates sustainable worth for the tourism and hospitality industry (Simon et al., 2020).

Context

The literature on HRI in the TTH sector has analyzed various aspects like consumer perception of robot services, willingness to give additional tips for robot restaurants influenced by demographics, psychographics, experience, and service preference, and investigated how these robots can affect guests' attitudes, perceptions, and behaviors (Chuah et al., 2022). The literature has also focused on exploring the adverse effects of robots' service and affective human-likeness on customer satisfaction in service encounters (Belanche et al., 2021). The research goal is to analyze the importance of consumer-robot relationship norms and the impact of social discomfort.

The previous studies also emphasize the significance of contextual elements in understanding the intentions of hotel employees to use service robots (Leung et al., 2023). Moreover, other studies have also explored the employees' perception of robot usage in the industry and emphasize the relationship between service robots and perceived discrimination in the context of tourism and hospitality (Seyitoğlu & Ivanov, 2023; Vatan & Dogan, 2021). Finally, research emphasizes that understanding HRI in the TTH industry is important for several other reasons as well, specifically examining how tourists react to masked service robots and how political ideology affects their behavior of interaction with robots (Zhang et al., 2022).

Key Constructs

HRI research in the TTH sector has explored a range of psychological, behavioral, and contextual factors influencing the adoption of service robots. Prior studies have examined how robot anthropomorphism, service context, technology anxiety, and perceived control impact on acceptance of customers (Gursoy et al., 2019; Belanche et al., 2023). However, many studies fall short of addressing other potentially significant variables such as cultural alignment, emotional reactivity, and task-service fit. Some works have begun to explore moderating effects such as the type of service setting (e.g., fine dining vs. quick service), level of robot autonomy, and design anthropomorphism on user evaluations (Wang & Papastathopoulos, 2024; Liu et al., 2025). Yet, research often overlooks the combined impact of emotional, cultural, and experiential variables on trust, perceived risk, and behavioral intention (Fan et al., 2024; Shuqair et al., 2024).

Recent studies call for a deeper investigation into constructs such as value co-creation (Balaji et al., 2025), social presence, empathy alignment (Pitardi et al., 2024), and technology readiness to explain consumer variance. For instance, constructs like employee identity, job security perception, and robot–human role boundaries are crucial in shaping hospitality employees' willingness to engage with robotic systems in operational roles (Chuah & Soeiro, 2025). Therefore, this review identifies and synthesizes constructs across the HRI literature to build a coherent understanding of independent variables (e.g., trust, perceived usefulness), dependent variables (e.g., acceptance, satisfaction), moderators (e.g., robot type, demographics), and mediators (e.g., perceived ease of use, social influence) supported by empirical studies.

Independent variables

This review identifies eight key independent variables from 103 articles spanning 2000–2025. These include service, technology features, user characteristics, trust and perception, design and anthropomorphism, interaction quality, emotions and attitudes, and contextual factors. Table 3 provides a summary of all identified independent variables along with representative examples, core insights, and the number of supporting articles.

Table 3. Independent Variables explored in HRI Literature

Variables	Article count	Examples	Core Insights
Service	45	Type, provider quality, technology	The service type, provider quality, and technology experience influence HRI both positively and negatively.
Technology Features	32	Functionality, reliability, and AI capability	Advanced features and higher functionality increase user acceptance and satisfaction with robots.
User Characteristics	28	Age, experience, tech-readiness	Younger and more tech-ready users tend to exhibit higher acceptance of service robots.
Trust and Perception	26	Perceived trust, perceived risk, reputation	Higher trust levels reduce risk perception and enhance service robots' usage intention.
Design and Anthropomorphism	24	Human-likeness, appearance, voice	More human-like designs evoke greater engagement but can also lead to discomfort (uncanny valley).
Interaction Quality	21	Rapport, responsiveness, communication	Interactive and responsive robots contribute to a better customer experience and perceived service quality.
Emotions and Attitudes	20	Satisfaction, enjoyment, fear, anxiety	Positive emotions like enjoyment increase the intention to use, while anxiety can hinder adoption.
Contextual Factors	15	Pandemic influence, cultural context, service environment	External factors like COVID-19, setting, and culture significantly shape consumer responses to robots.

Dependent Variables

This review identifies six key dependent variables: behavioral intention, user satisfaction, adoption and use, engagement, perceived service quality, and trust formation. Table 4 provides the details of each variable, examples of the variables, and core insights of the dependent variables.

Table 4. Dependent Variables explored in HRI Literature

Variables	Article count	Examples	Core Insights
Behavioral Intention	38	Intention to use, reuse, and recommend	Behavioral intention is significantly influenced by technology features, trust, and design.
User Satisfaction	32	Overall satisfaction, contentment, and experience rating	User satisfaction increases when robots are interactive, efficient, and contextually appropriate.
Adoption and Use	28	Actual usage, frequency of interaction, and willingness to adopt	Adoption depends on prior tech experience and perceived benefits over traditional service.
Engagement	25	User involvement, interaction depth, attention	Higher engagement is achieved through personalization and responsiveness in robot behavior.
Perceived Service Quality	22	Service quality perception, expectations vs. experience	Perceived service quality improves with better design, communication, and functionality.
Trust Formation	18	Formation of trust, trust in robot/hotel/brand	Trust is shaped by transparency, consistent behavior, and the contextual fit of robots.
Perceived Value	17	Cost-benefit perception, utility, outcome evaluation	Higher perceived value correlates with emotional engagement and functional benefits.
Emotional Response	14	Delight, anxiety, fear, and enjoyment	Emotional responses strongly mediate the link between interaction quality and acceptance.

Key Variables- Moderators

The moderator variables help in understanding the complex relationships between the independent variables and the dependent variable. The exploration and analysis of moderator variables facilitate researchers to comprehend the complexities of these relationships, refine their research hypothesis, avoid overgeneralizations, and interpret results more precisely. Table 5 reports and explains the moderator variable comprehensively.

Table 5. Moderator Variables explored in HRI Literature

Moderator	Articles Count	Examples	Core Insights
Demographics	22	Age, gender, and education	Demographic traits often moderate the impact of design and trust on user intention.
Cultural Context	20	Collectivism vs. individualism, regional norms	Cultural background shapes expectations and acceptance of robots in different regions.
Robot Type	18	Humanoid vs. non-humanoid, autonomous vs. semi-autonomous	Robot type affects perceived trust, utility, and emotional comfort.
Task Type	16	Routine tasks vs. complex services	Task complexity moderates satisfaction and perceived service quality.
Service Context	15	Restaurant, hotel, health, travel	Service environment influences the relevance and acceptance of robot behavior.
User Experience Level	14	First-time vs. repeat users	User experience level changes the evaluation of interaction quality and usefulness.
Technology Readiness	12	High vs. low tech-readiness	Tech readiness influences how design and performance affect intention to use.
Emotional State	10	Anxiety, excitement, curiosity	Users' emotional states alter how they respond to robot appearance and interaction.

Mediator Variables

Mediator variables are intervening variables that facilitate explaining the "why" and "how" of the relationship between the independent variables and the outcome variable. In the HRI research, the mediator variables provide a comprehensive understanding of the causal pathways that can not be explained by simple correlation analysis. This study supports the view that reporting the most significant mediators from the past research may support the future exploration that builds upon the current knowledge. In light of this, the mediator variables were examined in the HRI literature, and multiple significant mediator variables were discovered from different studies. The most prevalent mediator variables are perceived trust, emotions, technology anxiety, attitude towards robots, perceived usefulness, perceived ease of use, perceived enjoyment, and social presence. Table 6 reports and explains the mediator variables used in the extant literature on HRI.

Table 6. Mediator Variables explored in HRI Literature

Mediator Variable	No. of Articles	Examples	Select Key Findings
Perceived Trust	20	Trust in service robots, trust in the provider	Trust mediates the link between robot design and user adoption intention.
Emotions	18	Fear, enjoyment, satisfaction	Emotions like fear or enjoyment bridge interaction quality and continued usage.

Mediator Variable	No. of Articles	Examples	Select Key Findings
Technology Anxiety	16	Worry about malfunction, discomfort with AI	Technology anxiety mediates the positive impact of robot attributes on satisfaction.
Attitudes Toward Robots	15	Positive or negative attitudes are shaped by prior experience	Attitudes mediate the influence of prior experience and communication on use intention.
Perceived Usefulness	14	The belief that robot helps achieve tasks effectively	Perceived usefulness strengthens the effect of performance and functionality on behavioral intention.
Perceived Ease of Use	12	Perception that the robot is easy to use or learn	Ease of use explains how design influences intention and engagement.
Perceived Enjoyment	11	Fun, interest, and pleasure from interaction	Perceived enjoyment mediates the impact of robot interaction on loyalty and reuse.
Social Presence	10	Feeling of being socially connected to the robot	Social presence links human-likeness and interactivity to trust and satisfaction.

Methodologies in HRI Research

Examining methodologies used in past research reveals interesting information about the prevalence of particular methods, methodological strengths, bias and weaknesses, underused methods, diversity of approaches, credibility, and rigor of studies. By examining how past researchers of HRI approached their research, future researchers may identify knowledge gaps, compare findings across different approaches, justify methodological choices, and refine their own data collection and data analysis methods. In the current study, the methodologies adopted in the extant literature were analyzed to discover the diversity and discourse on research approaches and data analysis methods used in the HRI literature. Tables 7 and 8 report the data collection and analysis approaches in HRI.

Data Collection Methods

Researchers may discover methods that are valid, reliable, and relevant in the current context. While poorly collected data might lead to misleading conclusions. Hence, analyzing different data collection methods in the context helps researchers select the most appropriate method for credible and generalizable results. Table 7 reports the diversity in data collection methods evident in HRI research.

Table 7. Data Collection Method

Method	Article count	Percent (%)	Sample of Studies
Survey	20	19.4	(Han et al., 2025; Parvez et al., 2022)
Secondary Data Analysis	11	10.7	(Amiri & Karahanna, 2022)
Experiment	25	24.3	(Choi et al., 2024; Liu et al., 2025)
Interview/ Focus Group Discussion	8	7.8	(Rasheed et al., 2023)
Study (Conceptual /Theoretical)	13	12.6	(Kim et al., 2023; Cao et al., 2025)
Online Content Analysis	14	13.6	(Borghi & Mariani 2024; Wu & Huo 2023)
Thematic Analysis	7	6.8	(Majeed et al., 2024; Vatan & Dogan 2021)
Mixed Methods	3	2.9	(Gong et al., 2025; Sun et al., 2025)
Meta-Analysis/Bibliometric	2	1.9	(Begum et al., 2025)

Data Analysis Methods

The data analysis techniques used in the HRI literature are reported in Table 8. Reviewing the previous research on HRI, potential researchers can identify gaps or limitations in existing research, learn from the limitations of previously used methods and data analysis techniques, and avoid common pitfalls.

Table 8. Data Analysis Method

Technique of Data Analysis	Article count	Percent (%)	Sample of Studies
Qualitative data analysis	12	11.7	(Fuentes-Moraleda et al., 2020)
Regression	16	15.5	(Song et al., 2022)
Factor analysis (CFA, EFA)	14	13.6	(Seyitoğlu & Ivanov, 2020; Song et al., 2022)
Structural equation modeling (SEM)	7	6.8	(Chuah et al., 2022; Iuo et al., 2021)
Thematic analysis	7	6.8	(Vatan & Dogan, 2021; Fu et al., 2022)
Content analysis	1	1	(Fuentes-Moraleda et al., 2020)
Descriptive statistics	9	8.7	(Wang & Papastathopoulos, 2024)
Cluster analysis	3	2.9	(Borghi & Mariani, 2024)
Mixed methods / multi-technique	6	5.8	(Gong et al., 2025; Sun et al., 2025)
Unspecified/unclear	28	27.2	Multiple conceptual/review-based studies

Discussion

This research critically evaluates the theoretical underpinings, key constructs, recurring methodologies, contexts, and scenarios that are most prevalent in HRI literature using the TCCM framework. Fig. 3 illustrates the key constructs and their interrelationships. This study found that HRI research in the TTH domain is mostly related to service robots (concierge robots, cleaning robots, robotic receptionists, robotic tour guides, robowaiters), and a limited focus is given to industrial robots (Begum et al., 2025; Sun et al., 2025). The main focus of HRI research is on enhancing customer experience, reducing operational costs, and handling labor shortages. Studies consistently show that HRI is driven by differences in age, culture, purpose, trust, perceived competence, and anthropomorphism. Hence, this study could find a limited focus on enhancing the autonomy of robots in TTH and the impact of enhanced robot autonomy on HRI. In the TTH sector, future explorations are needed to examine the ideal balance between robot autonomy and human control because human interaction and personal touch are paramount in TTH. Therefore, human-in-the-loop or co-robotics systems become strategically important in TTH.

Table 9. Research Framework for HRI in TTH

Independent Variables	Mediator Variables	Dependent Variables
Service Attributes Tech Features User Characteristics Trust & Perception Interaction Quality Emotion & Attitudes Contextual Factors	Perceived Trust Emotions Tech Anxiety Attitudes towards Robots Usefulness Ease of Use Enjoyment Social Presence	Behavioral Intention User Satisfaction Adoption and use Engagement Service Quality Trust Formation Perceived Value Emotional Response
Moderator (influences all the paths above): Demographics, cultural context, robot type, task type, service context, user experience, tech readiness, emotional state		

This study reports that numerous efforts have been made to explore the acceptance of robots using theoretical underpinings adapted from the TAM, TAM2, and UTAUT frameworks. While numerous studies highlight the value of user-centered design in HRI, many studies rely on data collected from a single country. Hence, these studies lack longitudinal validation, which limits their generalizability. Poor generalization across cultures or age groups imposes a critical research gap because, despite progress in robot empathy and emotion recognition (Fan et al., 2024), few studies have addressed cultural variance in emotional expression, which is critical for global deployment. Further, multimodal interaction techniques

in HRI have given momentum to the emergence of naturalistic communication that involves speech, gesture, and facial expressions, where service-robot anthropomorphism has significantly influenced the adoption of robots in TTH settings (Kim, Lee, & Kang, 2023). However, there is a need to explore multidimensional anthropomorphism as a key construct for predicting acceptance of AI at the operational level and customer level in TTH. Across recent studies on HRI, there has been a clear shift toward AI transparency and ethical concerns (Shuqair et al., 2024), workplace depersonalization (Liu et al., 2025), enhancing the role clarity and emotional empathy (Fan et al., 2024), designing inclusive HRI environments (Gonzalez-Jimenez & Costa Pinto, 2024), and optimizing eco-efficient HRI systems (Han & Kim, 2024).

Avenues for Future Research

Drawing from the TCCM analysis of 103 studies on HRI in the TTH sector. The current study charts the main avenues for future research. As HRI is a contemporary area of research, the lack of longitudinal studies evaluating HRI effectiveness over time is evident. Future studies should explore how guests' and employees' perceptions, satisfaction, acceptance, behaviour, and loyalty evolve with time. Moreover, future studies should explore how HRI impacts the strategic, tactical, and operational levels in the TTH firms. Table 9 details an agenda for future research in HRI, highlighting both practical and theoretical implications. The subsequent subsections detail the agenda at the strategic, operational, and industry levels.

Table 10. Future Research Agenda

Research Level	Research Theme	Research Content	Contemporary Trends	Research Thrust	Reference
Strategic & Framework	HRI	Examines AI ethics and user distrust	AI transparency, ethical design	Strategies for trust in AI	Shuqair et al., 2024
Operational / Service	HRI interaction	Explores dissonance from a robotic coworker	Workplace depersonalization	Managing hybrid thumans-robot teams	Liu et al., 2025
Strategic / Services	Robot Adoption	Value co-creation in robotic service	Robot capability & personality	Personalization in deployment	Balaji et al., 2025
Industry / Governance	HRI regulation	GenAI-related security and privacy	AI compliance, regulation	Ethical AI frameworks	Luo et al., 2025
Cross-industry / Experience	HRI evaluation	Robot-human fit and retention	Role clarity and emotional empathy	Robot-user fit	Fan et al., 2024
Strategic / Industry	AI integration	Impact of AI errors on decision-making	Generative AI in service	AI validation mechanisms	Kim et al., 2025
Service / Operational	Customer Experience	Design and social inclusion	Immersive augmentation, inclusion	Inclusive HRI design	Gonzalez-Jimenez & Costa Pinto, 2024
Industry	Robot Acceptance	TAM/UTAUT meta-analysis in hospitality	Model validation and generalizability	Adoption model validation	Begum et al., 2025
Operational	Robotic Delivery	Environmental impacts of robot delivery	Sustainability in service robotics	Eco-efficient HRI	Han & Kim, 2024
Strategic	Employee Interaction	Emotional impact on frontline staff	Affective labor and technology	Resilience training for HRI	Chuah & Soeiro, 2025

Strategy Level

The strategic application of HRI in hospitality and tourism is gaining momentum as businesses seek to enhance service delivery and guest experiences. Current studies have emphasized the need for strategic alignment between robotic service implementation and broader organizational goals (Xu et al., 2023;

Rasheed et al., 2023). The literature reflects growing interest in theories like TAM, UTAUT, and S-O-R, which help define the adoption roadmap of AI and robotics at the strategic level. However, more cross-cultural and multi-country comparisons are needed to evaluate the scalability and adaptability of such strategic frameworks.

Operational Level

At the operational level, HRI applications are increasingly visible across customer care, concierge services, robotic cooking, and automated delivery (Casillo et al., 2020; Fusté-Forné, 2021; Zhang et al., 2022). Despite promising outcomes in operational efficiency and guest satisfaction, limited studies have addressed the influence of environmental context, spatial-temporal factors, and robot design on consumer experience. The literature suggests the need for deeper exploration into how operational-level robots affect customer satisfaction, emotional engagement, and service perception, particularly in dynamic or culturally diverse environments.

Industry Level

Industry-wide research on HRI demonstrates strong potential for AI and robotics to enhance business values, enhance productivity, and increase time efficiency across tourism and hospitality businesses (Belanche et al., 2021; Fang et al., 2023). While hotels are the most studied context, there is a clear gap in exploring HRI in museums, airports, restaurants, and scenic attractions (Kuo et al., 2017). Future research should examine sector-specific challenges and customization needs to develop adaptable HRI models applicable across multiple service formats.

Implications

Implications for Academicians

For academic researchers, this review highlights the opportunity to address underexplored constructs such as emotional dissonance, robot-human fit, and ethical transparency in robotic service interactions. The findings suggest that theory development must now move beyond traditional adoption models and explore behavioral, psychological, and sociotechnical variables. There is also scope for expanding methodological rigor through mixed methods and longitudinal studies to examine changes in perception over time.

Implications for Practitioners

This study summarizes practical, in-depth information for hospitality practitioners, users seeking to adopt AI and robotics strategically. The analysis shows that successful HRI deployment depends on alignment between robot roles, customer expectations, and service goals. Practitioners should prioritize transparency, emotional responsiveness, and inclusivity in robot design. The findings also underscore the importance of staff training to manage hybrid service teams composed of both humans and machines.

Ethical Implications

Ethical considerations are very important while deploying HRI technologies in TTH sectors. As service robots are very common in customer-facing roles, concerns around privacy, transparency, and fairness are increasing. For example, customers may not always be aware whether the interaction is with a human or a robot; there could be a risk of information usage. Enterprises adopting such technologies must ensure that robots are designed and implemented in ways that comply with social responsibility and privacy. Ethical deployment of HRI in TTH is not only about avoiding harm but also about building trust with customers and employees. Therefore, ethical awareness must be part of the HRI strategy.

Conclusions

This systematic review presents a comprehensive analysis of 103 studies on HRI research in the TTH sector using the TCCM framework. While existing research highlights robotics' potential to improve service delivery and experiences, it remains fragmented in theoretical groundings and limited in cross-cultural, longitudinal, and emotion-centered studies. These gaps constrain the development of generalizable insights and scalable applications. Future research should prioritize theory-driven models, empirical validation, and context-sensitive approaches that account for cultural and emotional dimensions. As ethical, technological, and sustainability concerns grow, HRI emerges as a critical domain for innovation. This review offers a structured foundation for advancing academic discourse and guiding the responsible integration of robotics in human-centric hospitality and tourism systems.

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