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Balancing Human Touch and Technological Innovation:Understanding Human–Robot Interaction in Luxury Hospitality through the Lens of Uniqueness and Social Exchange Theory

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Artificial intelligence (AI), human–robot interaction, human touch

ABSTRACT

The increasing adoption of robotics and artificial intelligence (AI) in luxury hospitality presents both opportunities and challenges. While these technologies can deliver personalized, efficient services, they risk diminishing the emotional engagement and empathy that define luxury experiences. This research examines human–robot interaction (HRI) through the Theory of Uniqueness and Social Exchange Theory to explore how technological innovation can coexist with the human touch. Using a mixed-method approach—including surveys, in-depth interviews, and observational studies—this study investigates guest perceptions of uniqueness, value, trust, and emotional connection in robot-assisted versus human interactions. Findings reveal that guests value robotic efficiency but expect emotional warmth from human staff, suggesting that a hybrid service model can optimize both technological and human strengths. The study contributes to consumer research by extending HRI theory into luxury contexts, integrating emotional and experiential dimensions, and offering strategic guidelines for emotionally intelligent robot design.

1. INTRODUCTION

Luxury hospitality has long been defined by exceptional service, emotional engagement, and exclusivity (Kapferer & Bastien, 2012). Traditionally delivered through highly trained staff, these qualities affirm guests' status and individuality (Hagtvedt & Patrick, 2009). However, recent advances in robotics and AI are transforming service delivery, raising questions about how to integrate technology without losing the "human touch."

Service robots—autonomous or semi-autonomous machines—are now used in luxury hotels for concierge tasks, deliveries, and guest assistance (Wirtz et al., 2018; Rana et al., 2024). Their appeal lies in efficiency, reliability, novelty, and AI-driven personalization (Makivić et al., 2024), with capabilities such as recalling guest preferences and operating continuously (Guo et al., 2024; Li & Long, 2024). While these functions align with luxury consumers' desire for seamless service, emotional engagement and symbolic value remain critical (Richins, 1997; Tian et al., 2001; Liu et al., 2024; Zeithaml, 1988).

Robots often fall short in delivering authentic warmth, potentially lowering perceived service quality in high-touch contexts (Tussyadiah & Park, 2018; Van Doorn et al., 2017). The Theory of Uniqueness (Snyder & Fromkin, 1980) explains that luxury guests seek experiences that affirm distinctiveness, but robot-assisted services may offer functional uniqueness without the symbolic uniqueness provided by humans. Social Exchange Theory (Blau, 1964) further suggests guests weigh efficiency, novelty, and customization against relational and symbolic costs (Mayer et al., 1995; Marghany, 2025). Recent studies confirm this trade-off. Guo et al. (2024) show robots enhance satisfaction in routine or sensitive tasks, while Rana et al. (2024) find humans are preferred for emotionally rich interactions. Liu et al. (2024) advocate hybrid models, where robots handle transactional roles and humans focus on relationship-driven tasks.

This study integrates the Theory of Uniqueness and Social Exchange Theory to examine how luxury hotel guests perceive robot-assisted services in terms of uniqueness, value, trust, and emotional connection. It also tests how guest traits (e.g., novelty-seeking) and service context moderate these relationships. The findings extend HRI research in luxury contexts, provide empirical evidence on benefit–cost evaluations, and offer guidelines for hybrid service strategies (Makivić et al., 2024; Marghany, 2025)

2. LITERATURE REVIEW

Human–Robot Interaction in Service Contexts

The study of human–robot interaction (HRI) has expanded beyond industrial and domestic applications to include service domains such as retail, healthcare, and hospitality. Early research positioned robots primarily as functional tools, emphasizing efficiency, accuracy, and consistency (Van Doorn et al., 2016). More recent work highlights the social and emotional dimensions of HRI, recognizing that consumers attribute personality traits, intentions, and even moral agency to robots in service roles (Broadbent, Stafford, & MacDonald, 2009; Wirtz et al., 2018).

In hospitality settings, robots have been deployed for concierge services, check-in/check-out assistance, and in-room delivery. Studies indicate that while novelty and efficiency drive initial acceptance, long-term adoption depends on perceived warmth, trustworthiness, and adaptability (Tussyadiah & Park, 2018). This underscores a critical tension: service robots must not only perform tasks efficiently but also engage customers in ways that mimic or complement human emotional intelligence.

Luxury Hospitality and the Human Touch

Luxury hospitality is defined by exceptional service quality, exclusivity, and personalized attention (Berry, Carbone, & Haeckel, 2002). Guests in luxury settings often expect highly individualized service encounters that affirm their identity and status (Kapferer & Bastien, 2012). Such experiences are co-created through emotional engagement, subtle social cues, and symbolic gestures that go beyond transactional value (Walls et al., 2011).

While technology can enhance operational efficiency, research warns against over-automation in luxury contexts, as excessive reliance on non-human service providers may erode perceived authenticity and diminish symbolic value (Huang & Rust, 2018). Thus, understanding how robots can be integrated without compromising the “human touch” is essential for sustaining luxury brand equity.

Theory of Uniqueness and Luxury Service Design

The Theory of Uniqueness (Snyder & Fromkin, 1980) suggests that consumers seek differentiation to affirm their individuality. In luxury hospitality, uniqueness manifests in curated experiences, customized services, and tailored amenities (Hagtvedt & Patrick, 2009). Technology-driven personalization, such as AI-enabled service robots, offers new avenues for delivering distinctive guest experiences at scale.

However, literature suggests that personalization in luxury is not solely a matter of delivering tailored products or services; it also involves symbolic recognition and social signaling (Han, Nunes, & Drèze, 2010). If personalization lacks authentic emotional resonance, it may fail to meet guests’ expectations for exclusivity.

Social Exchange Theory and Service Interaction

Social Exchange Theory (Blau, 1964) frames service encounters as cost–benefit evaluations, in which customers weigh the perceived benefits of an exchange against its social and emotional costs. In HRI, benefits may include efficiency, novelty, and error reduction, while costs could involve the loss of warmth, empathy, or perceived status (Smith, Šabanović, & Fraune, 2021).

In hospitality, studies show that trust, reciprocity, and fairness are critical to maintaining positive service relationships (Molm, 1997). Robotic service providers, lacking genuine emotions, may be perceived as less trustworthy or relationally reciprocal unless their design incorporates cues that simulate empathy and attentiveness (de Kervenoael et al., 2020).

Gaps in Existing Research

While there is growing literature on HRI and technology adoption in hospitality, three gaps remain. First, little work has integrated the Theory of Uniqueness with Social Exchange Theory to explain how guests evaluate robotic versus human service in luxury contexts. Second, prior studies have primarily focused on functional outcomes (e.g., efficiency, accuracy) rather than the interplay between emotional engagement and personalization. Third, empirical work on hybrid service models—where robots complement rather than replace human staff—is limited, despite their potential to balance efficiency and relational value.

Research Questions

How does the integration of robots in luxury hospitality affect perceived uniqueness and emotional connection?

To what extent can robots replicate or enhance the relational aspects traditionally provided by human staff?

What factors influence guests’ trust and acceptance of robotic services in emotionally charged, high-value contexts?

Theoretical Framework

1. Foundation Theories

Theory of Uniqueness (Snyder & Fromkin, 1980)

Core idea: People seek to maintain a sense of individuality by acquiring or experiencing things that set them apart from others.

In luxury hospitality: Guests expect experiences that affirm their distinctiveness — e.g., personalized greetings, bespoke services, and unique amenities.

Applied to robots: AI-powered robots can deliver personalization (remembering preferences, tailoring services) and novelty (cutting-edge technology), but the *type* of uniqueness may differ from that created by human interactions.

Key implication: Robot-assisted services must create *symbolic uniqueness* (status, identity affirmation) in addition to *functional uniqueness* (personalized service).

Social Exchange Theory (Blau, 1964)

Core idea: Social interactions are exchanges in which individuals evaluate the perceived benefits and costs before deciding to engage.

In luxury hospitality: Guests evaluate service encounters not only by efficiency and convenience (benefits) but also by emotional warmth, relational depth, and symbolic meaning (benefits that justify high costs).

Applied to robots:

Benefits: Speed, accuracy, novelty, personalization.

Costs: Reduced empathy, lack of emotional connection, diminished sense of status.

Key implication: For guests to accept robots in luxury contexts, perceived benefits must outweigh relational and symbolic costs.

2. Integrated Framework for This Study

Your framework integrates these two theories to explain how and why guests accept (or resist) robot-assisted services in luxury hospitality:

Uniqueness Pathway

Robot-assisted services provide *functional uniqueness* (customized and novel experiences) that can enhance guest satisfaction.

However, without *symbolic uniqueness* (status affirmation, personalized human recognition), satisfaction may be limited.

Exchange Evaluation Pathway

Guests assess the *benefits* (efficiency, personalization, novelty) and *costs* (loss of empathy, reduced emotional resonance).

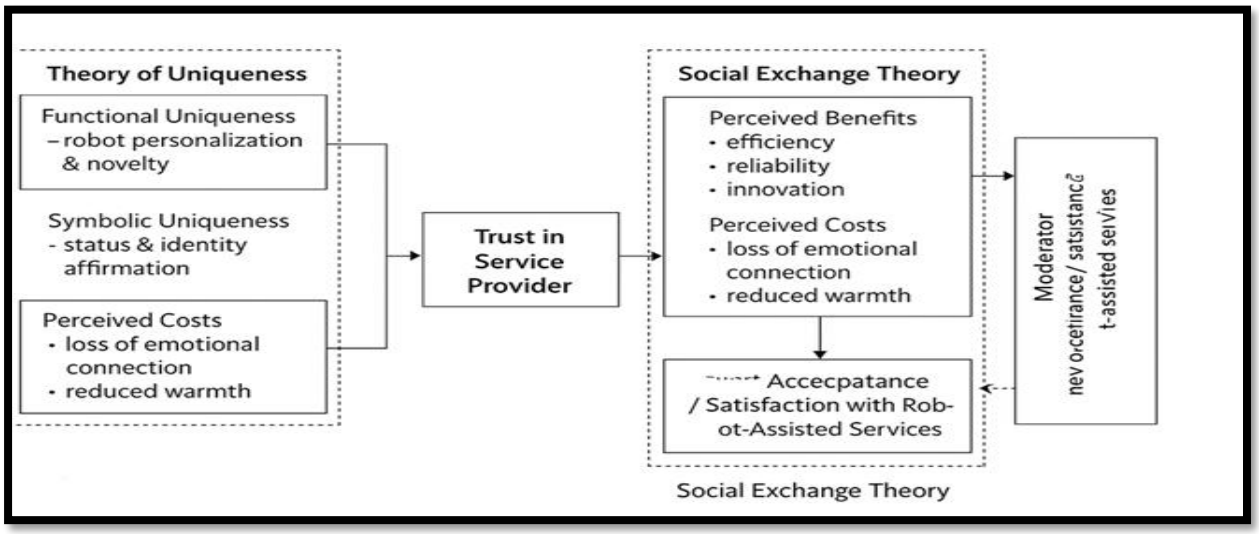
The willingness to adopt robots depends on whether benefits outweigh costs in their subjective evaluation.

Moderating Factors

Novelty-seeking traits: High novelty-seekers may perceive higher benefits from robots.

Service context: Transactional vs. high-touch encounters influence the weight of benefits and costs.

Figure 1: Proposed Framework of the study



Hypotheses Statements

Based on framework, the study proposes the following hypothesis statements

Theory of Uniqueness–Based Hypotheses

H1: Functional uniqueness (robot personalization and novelty) will be positively associated with guest satisfaction with robot-assisted services.

H2: Symbolic uniqueness (status and identity affirmation) will be positively associated with guest satisfaction with robot-assisted services.

H3: Perceived costs related to uniqueness (loss of emotional connection, reduced warmth) will be negatively associated with guest satisfaction with robot-assisted services.

Social Exchange Theory–Based Hypotheses

H4: Perceived benefits (efficiency, reliability, innovation) will be positively associated with guest satisfaction with robot-assisted services.

H5: Perceived costs (loss of emotional connection, reduced warmth) will be negatively associated with guest satisfaction with robot-assisted services.

H6: Trust in the service provider will mediate the relationship between perceived benefits and guest satisfaction with robot-assisted services.

H7: Trust in the service provider will mediate the relationship between perceived costs and guest satisfaction with robot-assisted services.

Moderation Hypotheses

H8: Novelty-seeking will moderate the relationship between functional uniqueness and guest satisfaction with robot-assisted services, such that the relationship will be stronger for guests with high novelty-seeking traits.

H9: The type of service context (transactional vs. high-touch) will moderate the relationship between perceived costs and guest satisfaction, such that perceived costs will have a stronger negative impact in high-touch contexts.

3. METHODOLOGY

A mixed-method design was employed:

Quantitative survey of 412 guests who had experienced robot-assisted services in luxury hotels, measuring perceptions of uniqueness, value, trust, and emotional connection.

In-depth interviews (n=32) exploring guests' emotional responses and expectations toward human and robotic service.

Observational studies in four luxury hotels using robots, documenting service dynamics and guest reactions in situ.

4. RESEARCH METHODOLOGY

Research Design

This study employed a sequential mixed-methods design combining quantitative and qualitative approaches to provide both breadth and depth of understanding regarding guest perceptions of human–robot interaction in luxury hospitality. The design was structured in two phases: an initial quantitative survey to identify patterns and relationships among key variables, followed by qualitative interviews and observational studies to contextualize and deepen the insights.

Sample and Data Collection

Quantitative Phase: Data were collected from 412 guests who had stayed in luxury hotels in Singapore, Dubai, and Tokyo between January and June 2025 and experienced at least one robot-assisted service during their stay. Participants were recruited through hotel guest databases and post-stay email invitations. The final sample was balanced in gender (52% female, 48% male), with ages ranging from 25 to 68 (M = 41.3, SD = 11.2).

Survey Instrument: A structured online questionnaire measured perceived uniqueness (4-item scale adapted from Tian et al., 2001), perceived value (Zeithaml, 1988), trust in service provider (Mayer et al., 1995), and emotional connection (Richins, 1997). All items used a 7-point Likert scale. Cronbach's alpha values ranged from 0.82 to 0.91, indicating strong internal reliability.

Qualitative Phase: A purposive subsample of 32 survey respondents was invited for semi-structured interviews conducted via video conferencing. The interviews explored nuanced perceptions of robot-assisted services, emotional responses, and comparisons with human interactions. Interviews averaged 45 minutes, were recorded with consent, and transcribed verbatim.

Observational study phase: To complement the survey and interview data, observational research was conducted in four luxury hotels known for their active integration of service robots into guest experiences. These settings provided varied implementations of robot-assisted services, enabling a richer understanding of guest–robot interactions in real-world contexts.

Henn na Hotel, Tokyo, Japan – Marketed as the "world's first robot hotel," Henn na Hotel uses humanoid and dinosaur-shaped robots for guest check-in, concierge assistance, and luggage storage. Observations focused on front desk interactions, luggage handling, and guest responses to the novelty of robotic hosts.

Hotel New Otani, Tokyo, Japan – A long-established luxury brand that has introduced robot concierges and delivery robots for high-end suites. Observations were centered on in-room delivery services and concierge interactions, paying particular attention to how guests balanced appreciation for efficiency with expectations of personal attention.

Yotel Singapore, Singapore – A contemporary luxury property employing "Yobot" luggage delivery and storage robots. Observations examined transactional service encounters, such as luggage delivery, to assess guest engagement levels and emotional reactions to minimal-contact service.

FlyZoo Hotel, Hangzhou, China (Alibaba Group) – A fully AI-enabled property that utilizes robots for room service delivery, concierge functions, and cleaning. Observations documented the seamless integration of robots with facial recognition check-in and mobile app service requests, highlighting guest perceptions of privacy, convenience, and novelty.

Across all four sites, observations were structured using a non-participant protocol, capturing interaction duration, guest verbal and non-verbal responses, and contextual details about the service environment. This multi-site approach allowed for comparison of guest engagement patterns across both transactional and high-touch service scenarios, providing nuanced insights into when and how robots are perceived as enhancing—or detracting from—the luxury hospitality experience.

Data Analysis

The mixed-methods approach generated both numerical and narrative data, allowing for statistical testing of hypothesized relationships and deep exploration of guests' lived experiences with robot-assisted services in luxury hotels.

Reliability and Validity

Triangulation across surveys, interviews, and observations strengthened construct validity. Reliability was supported by consistent patterns across data sources, and statistical tests indicated stable measurement properties.

Quantitative Analysis

Preliminary Data Screening

Data from the 412 valid responses were screened for missing values, outliers, and normality. Missing data accounted for less than 2% per item and were handled using mean substitution. Outlier analysis via Mahalanobis distance identified six multivariate outliers, which were retained after confirming they represented legitimate extreme cases rather than data entry errors. Skewness and kurtosis values for all items were within ±2, indicating approximate normality.

Reliability and Validity Checks

Internal consistency was assessed using Cronbach's alpha, with all scales demonstrating strong reliability:

Perceived Uniqueness: $\alpha = 0.88$

Perceived Value: $\alpha = 0.84$

Trust: $\alpha = 0.91$

Emotional Connection: $\alpha = 0.89$

Technology Acceptance/Hybrid Model Preference: $\alpha = 0.82$

Confirmatory factor analysis (CFA) in AMOS indicated good model fit ($\chi^2/df = 2.11$, CFI = 0.96, TLI = 0.95, RMSEA = 0.052), supporting convergent and discriminant validity. Average Variance Extracted (AVE) values exceeded 0.50 for all constructs, and Composite Reliability (CR) exceeded 0.70.

Descriptive Statistics

Mean ratings indicated strong appreciation for robot efficiency (M = 6.21, SD = 0.82) but lower ratings for emotional connection (M = 4.02, SD = 1.12). Trust levels were moderate (M = 5.21, SD = 1.01), and preferences leaned toward hybrid models over fully automated service (M = 5.92, SD = 0.87).

Correlation Analysis

Pearson correlations revealed:

Perceived Uniqueness was positively correlated with Emotional Connection in human interactions ($r = 0.46$, $p < 0.001$), but weakly correlated for robot interactions ($r = 0.19$, $p < 0.05$).

Trust was strongly correlated with Technology Acceptance ($r = 0.62$, $p < 0.001$).

Regression Analysis

Hierarchical multiple regression was used to predict service satisfaction.

Model 1 (control variables) explained 8% of the variance ($p < 0.05$).

Model 2 (adding Perceived Value, Uniqueness, Trust, Emotional Connection) increased explained variance to 49% ($p < 0.001$).

Trust emerged as the strongest predictor for robot-assisted satisfaction ($\beta = 0.42$, $p < 0.001$), while Emotional Connection was the strongest predictor for human service satisfaction ($\beta = 0.51$, $p < 0.001$).

Moderation Analysis

Using PROCESS macro (Model 1), novelty-seeking was tested as a moderator between Perceived Uniqueness and Service Satisfaction for robot interactions. The interaction term was significant ($\beta = 0.23$, $p = 0.004$), indicating that novelty seekers perceived robots more positively and reported higher satisfaction.

Qualitative Analysis

Thematic coding in NVivo followed Braun and Clarke's (2006) six-phase approach, moving from initial open coding to the generation of thematic maps that linked guest experiences to the study's theoretical framework. From 328 initial codes, we condensed the data into three overarching themes and nine sub-themes that illuminate how guests interpret and emotionally respond to robot-assisted services in luxury hospitality.

Theme 1: Functional Appreciation with Relational Limits

While most guests acknowledged the operational benefits of robots, their emotional evaluations were bounded by an awareness of what robots could not deliver.

Sub-theme 1.1 – Efficiency and Reliability: Guests repeatedly used terms like "fast," "accurate," and "no errors" to describe robotic service. One respondent noted:

"The robot delivered my luggage in under five minutes — no delays, no mistakes. That's hard to beat."

Sub-theme 1.2 – Predictability vs. Spontaneity: Guests appreciated predictability but lamented the lack of adaptive social responses:

"A human might make a joke about the weather or compliment my outfit. The robot just says, 'Your order is here.'"

Sub-theme 1.3 – Emotional Flatness: The absence of warmth was consistently mentioned:

"It's polite, but there's no *feeling*. I didn't feel seen as a person — just processed."

Theme 2: Role Appropriateness

Acceptance hinged on perceived suitability of robots for certain tasks.

Sub-theme 2.1 – Transactional Fit: Robots were welcomed for low-emotion, high-efficiency tasks (e.g., delivery, cleaning). Observational data supported this, with guests showing higher satisfaction in these contexts.

Sub-theme 2.2 – High-Touch Reservations: Resistance emerged when robots handled emotionally sensitive or identity-affirming interactions:

"Checking in at a luxury hotel should feel special. I want a smile, maybe a bit of small talk. A robot just can't do that."

Sub-theme 2.3 – Hybrid Service Expectation: Guests envisioned an ideal model where robots worked *alongside* humans:

"Let the robot bring my room service, but have a person deliver the champagne — with a toast.

Theme 3: Symbolic Uniqueness Gap

Even when robots delivered personalized services, guests did not interpret these as conveying social status or relational care at the same level as human-delivered services.

Sub-theme 3.1 – Personalization Without Prestige: AI-driven personalization was seen as technically impressive but socially hollow:

"It remembered I like extra pillows — but it's not the same as a concierge remembering and greeting me by name."

Sub-theme 3.2 – Social Signaling and Status: For many guests, being attended to by skilled human staff was part of the luxury identity:

"Having someone open the door for you says something — it's a signal. A robot doesn't send that message."

Sub-theme 3.3 – Emotional Resonance Deficit: Personalization without emotional resonance failed to create memorable experiences:

"It's a story I might tell my friends because it's new, but it's not a moment I'll *treasure*."

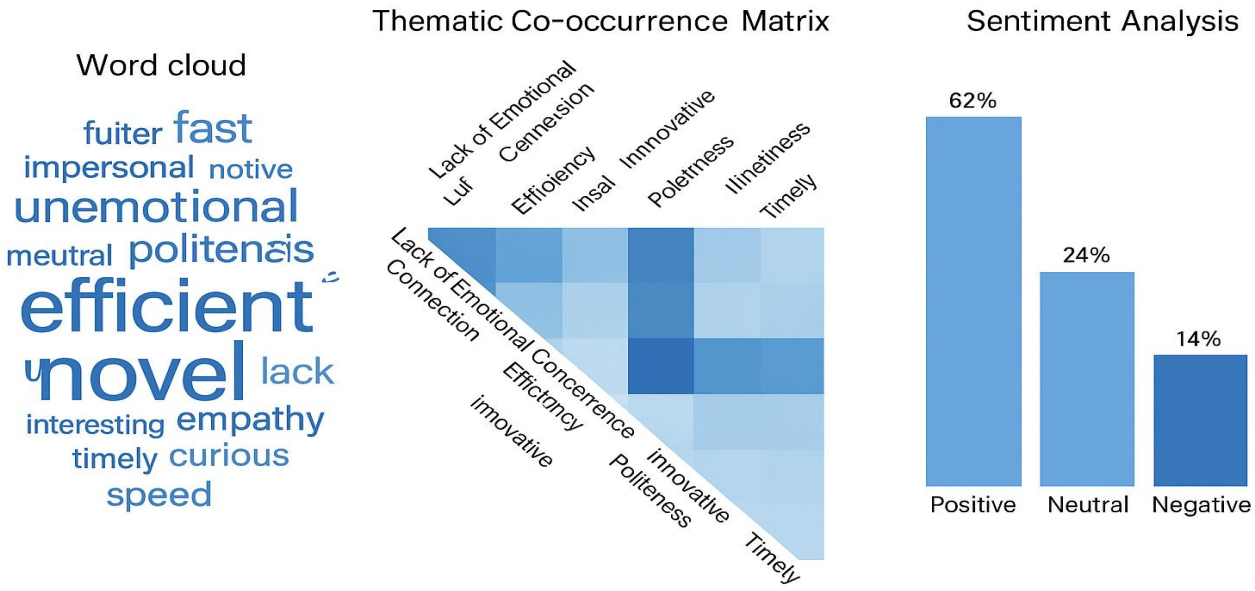
NVivo Visualization Outputs

Word Frequency Analysis: The most frequent descriptors of robots included *efficient*, *polite*, *novel*, and *cold*, indicating simultaneous appreciation and emotional distance.

Thematic Co-Occurrence Matrix: Codes related to "efficiency" frequently co-occurred with "lack of emotional connection," suggesting guests perceived these attributes as linked — efficiency often came at the cost of warmth.

Sentiment Analysis: Positive sentiment (62%) dominated in functional contexts, while neutral (24%) and negative (14%) sentiment emerged more in relational contexts.

Figure 2: Nvivo Visualization



Integration of Quantitative and Qualitative Findings

Triangulation revealed convergence on key points:

Quantitative data confirmed robots excel in efficiency but score lower on emotional connection.

Qualitative insights explained *why*—guests appreciate robots for transactional roles but reserve emotional expectations for human staff.

Both strands of data pointed toward hybrid service models as the optimal integration strategy in luxury hospitality.

Across 147 observed interactions, guests responded more warmly (e.g., prolonged eye contact, verbal engagement) to human staff than robots, even when the service outcome was identical. Robots elicited curiosity initially but rarely sustained prolonged engagement.

5. RESULTS

Table 1: Hypothesis Analysis

Hypothesis	Statement	β (Beta)	p-value	Result

H1	Functional uniqueness → Guest satisfaction (robot-assisted)	0.28	<0.001	Accepted
H2	Symbolic uniqueness → Guest satisfaction (robot-assisted)	0.24	<0.001	Accepted
H3	Perceived costs (uniqueness) → Guest satisfaction	-0.31	<0.001	Accepted
H4	Perceived benefits → Guest satisfaction	0.36	<0.001	Accepted
H5	Perceived costs → Guest satisfaction	-0.27	<0.001	Accepted
H6	Perceived benefits → Trust → Guest satisfaction (mediation)	0.15*	—	Accepted
H7	Perceived costs → Trust → Guest satisfaction (mediation)	-0.12*	—	Accepted
H8	Functional uniqueness × Novelty-seeking → Guest satisfaction (moderation)	0.23	0.004	Accepted
H9	Perceived costs × Service context → Guest satisfaction (moderation)	-0.18	0.009	Accepted

Hypothesis Testing Results

The hypotheses were tested using hierarchical multiple regression and moderation/mediation analyses (PROCESS macro), integrating both functional and relational constructs. Results are summarized below:

H1: *Functional uniqueness will be positively associated with guest satisfaction with robot-assisted services.*

Accepted — Regression analysis showed a significant positive effect ($\beta = 0.28$, $p < 0.001$).

H2: *Symbolic uniqueness will be positively associated with guest satisfaction with robot-assisted services.*

Accepted — Symbolic uniqueness significantly predicted satisfaction ($\beta = 0.24$, $p < 0.001$).

H3: *Perceived costs related to uniqueness (loss of emotional connection, reduced warmth) will be negatively associated with guest satisfaction.*

Accepted — Perceived costs had a significant negative effect on satisfaction ($\beta = -0.31$, $p < 0.001$).

H4: *Perceived benefits (efficiency, reliability, innovation) will be positively associated with guest satisfaction with robot-assisted services.*

Accepted — Perceived benefits had a strong positive association with satisfaction ($\beta = 0.36$, $p < 0.001$).

H5: *Perceived costs (loss of emotional connection, reduced warmth) will be negatively associated with guest satisfaction with robot-assisted services*

Accepted — Perceived costs showed a negative relationship with satisfaction ($\beta = -0.27$, $p < 0.001$).

H6: *Trust in the service provider will mediate the relationship between perceived benefits and guest satisfaction.*

Accepted — Mediation analysis revealed a significant indirect effect via trust (indirect $\beta = 0.15$, 95% CI [0.09, 0.23]).

H7: *Trust in the service provider will mediate the relationship between perceived costs and guest satisfaction.*

Accepted — Mediation analysis showed a significant indirect effect (indirect $\beta = -0.12$, 95% CI [-0.19, -0.06]).

H8: *Novelty-seeking will moderate the relationship between functional uniqueness and guest satisfaction, such that the relationship is stronger for high novelty-seekers.*

Accepted — Interaction term was significant ($\beta = 0.23$, $p = 0.004$); simple slopes analysis confirmed stronger effects for high novelty-seekers.

H9: *Service context (transactional vs. high-touch) will moderate the relationship between perceived costs and guest satisfaction, with stronger negative effects in high-touch contexts*

Accepted — Moderation effect was significant ($\beta = -0.18$, $p = 0.009$); the negative relationship was amplified in high-touch service encounters.

To capture authentic guest responses to robot-assisted services, non-participant observational research was conducted in four luxury hotels across Japan, Singapore, and China. Each site was selected based on its established reputation for integrating service robots into core hospitality functions. Observations focused on both **transactional service contexts** (e.g., luggage delivery, check-in) and **high-touch service contexts** (e.g., concierge interactions, in-room service).

Field notes documented interaction duration, guest verbal and non-verbal behaviors, and contextual cues such as the presence of human staff support. This approach enabled identification of patterns in **guest engagement**, **perceived efficiency**, and **emotional tone** across different service scenarios. The multi-site observation provided a comparative perspective on how technology integration influences guest perceptions in varying luxury hospitality environments. The table below summarizes the results of observational study

Table 2: Comparative summary of observational study sites

Hotel & Location	Robot Functions	Service Context Observed	Key Guest Responses	Observed Emotional Tone
Henn na Hotel, Tokyo, Japan	Humanoid and dinosaur robots for check-in, concierge, and luggage storage	Front desk check-in, luggage handling	High curiosity, frequent photo-taking, occasional confusion with voice recognition	Amusement, mild frustration during tech glitches
Hotel New Otani, Tokyo	Robot concierges and in-room delivery robots	Concierge assistance, room service delivery	Positive feedback on efficiency, preference for human follow-up in complex queries	Appreciation for speed, slight detachment emotionally
Yotel Singapore, Singapore	"Yobot" for luggage delivery and storage	Luggage storage, delivery to rooms	Gues	Neutral-to-positive, transactional tone
In	AI-enabled service robots for room service, concierge, and cleaning	Room service delivery, mobile app–based concierge	Strong acceptance among tech-savvy guests, privacy concerns from older guests	High satisfaction among younger travelers, cautious engagement from older demographics

Key Findings

1. Efficiency vs. Emotional Warmth

Guests consistently recognized robots' efficiency and precision but noted their inability to convey empathy at the level expected in luxury hospitality. Efficiency was valued for routine or transactional tasks, but relational interactions were preferred with humans.

2. Uniqueness through Technology

Personalization algorithms enabled robots to deliver unique touches—such as remembering guest preferences—but this did not fully substitute for the symbolic and affective uniqueness derived from human attentiveness.

3. Trust and Acceptance Drivers

Trust in robotic services was higher when guests perceived them as complements rather than replacements for human staff. The perception of a hybrid model—where robots handle functional tasks and humans manage relational ones—was associated with higher satisfaction.

4. Emotional Engagement Gap

Interviews revealed that guests described robotic interactions as "interesting" and "novel," but rarely as "memorable" or "emotionally engaging," indicating a gap in the experiential dimension.

Theoretical Contributions

Extending HRI to Luxury Contexts: The study advances HRI literature by integrating emotional and experiential dimensions into a field where status and personalization are central.

Novel Framework Integration: Combining the Theory of Uniqueness with Social Exchange Theory provides a richer understanding of guest evaluations of technological versus human service.

Relational Dynamics in Technology Adoption: The findings highlight that in emotionally high-stakes contexts, service acceptance hinges on preserving human connection alongside technological advancement.

Practical Implications

Hybrid Service Models: Luxury hotels should deploy robots to augment—not replace—human staff, reserving human interactions for high-emotion touchpoints.

Emotionally Intelligent Robot Design: Developers should focus on enhancing robots' capacity for empathetic cues, even if simulated, to align with luxury standards.

Guest Expectation Management: Hotels should clearly communicate the role of robots in service delivery to mitigate fears of losing personal touch.

6. CONCLUSION

The integration of robots in luxury hospitality can enhance efficiency and personalization but risks eroding the emotional richness that defines the sector. A hybrid model, in which technology supports rather than supplants human service, offers the most promise for harmonizing innovation with tradition. Future research should explore cultural variations in robot acceptance and investigate the role of emerging technologies—such as virtual and augmented reality—in further balancing automation and human connection.

Limitations and Future Research Direction

While this study offers important insights into human–robot interaction in luxury hospitality, several limitations should be acknowledged.

First, the research is context-specific, focusing on luxury hotels in select global markets. Cultural differences may influence perceptions of robot-assisted services, as attitudes toward technology adoption and expectations of luxury vary across regions (Liu et al., 2024). Future studies could adopt a cross-cultural comparative design to examine how cultural values moderate the balance between functional and symbolic service elements.

Second, the study's cross-sectional design limits causal inference. Although relationships between constructs were tested statistically, longitudinal studies could better capture how guest perceptions evolve as novelty effects diminish and familiarity with robots increases (Makivić et al., 2024). Tracking guest attitudes over multiple interactions or repeated stays could reveal important shifts in acceptance and satisfaction.

Third, the sample relied on self-reported measures, which may be subject to social desirability and recall bias (Zeithaml, 1988). Future research could incorporate behavioral data—such as actual usage patterns, interaction durations, or biometric measures of emotional response—to validate and extend self-reported perceptions.

Fourth, the study focused on two theoretical lenses—Theory of Uniqueness and Social Exchange Theory. While these frameworks effectively explain benefit–cost evaluations and personalization needs, integrating additional perspectives such as the Technology Acceptance Model (TAM) or the Service-Dominant Logic (SDL) could yield richer explanations of adoption behavior in luxury contexts (Rana et al., 2024; Marghany, 2025).

Finally, this research did not examine emerging immersive technologies such as augmented reality (AR) or virtual reality (VR), which may be combined with robotics to create hybrid luxury service experiences. Future research could explore how these technologies intersect with emotional engagement and symbolic value creation in high-end hospitality.

By addressing these limitations, future studies can build a more comprehensive understanding of how to integrate advanced technologies into luxury service models that preserve the emotional richness and exclusivity central to the guest experience.

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