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AI service robots in a 4-star hotel: enhancing guest and employee experiences

Frederik Jan van der Meulen* ⓘ, Daniek Verhoeven, Juliet Chipumuro ⓘ & Wilson Majee ⓘ

Hotel Management School Leeuwarden, NHL Stenden University of Applied Sciences, Leeuwarden, The Netherlands
Correspondence: frederik.van.der.meulen@nhlstenden.com

ABSTRACT: Artificial intelligence (AI) has recently become a vital technology affecting several sectors, including hospitality. The expanding use of AI robots in functions previously performed by humans raises important issues — which are currently unknown — regarding how AI robotics may affect personnel and guests. This study examined guests' and staff's experiences with service robots in a 4-star southern Dutch hotel. The report offers the hospitality industry AI robot implementation advice. In-depth staff interviews and 4-star hotel guest surveys were completed. Data from customers and staff showed a need for service robots at the front office. This demand highlights the need for service robots at the front desk to serve leisure and business clients and to aid staff. However, both quantitative and qualitative studies imply that a tangible human welcome is still necessary, especially for leisure tourists. This study found that customers and personnel at the front office want service robots, with leisure and business guests preferring something different. These demographics perceive human connections as essential for a good visitor experience, emphasising the complexities of AI in hospitality.

KEYWORDS: hospitality industry, human-robot interaction, service automation, technological progress

Introduction

In recent years, society has observed notable technological progress, with AI gradually assuming responsibilities that were formerly performed by people. The implementation of service robots in the hotel sector is intended to augment individualised service and promote visitor contentment (Gupta et al., 2022). Nevertheless, the precise effect of service robots on both visitors and staff remains unknown at present (Lu et al., 2020). Therefore, it is important to perform a thorough evaluation of service robots, allowing businesses to determine the significance of incorporating robots into their operations. The objective of this study was to examine the influence of AI service robots on guests and employees in the hospitality industry, specifically focusing on a 4-star hotel situated in the southern part of the Netherlands as a case study.

The negative effect of COVID-19 on businesses, including the global hotel business, is not contested. Many establishments had to cease operations, while others made the decision to continue operating while facing exceptionally low levels of occupancy (Gursoy & Chi, 2020). Multiple studies have recorded large reductions in the occupancy rates and revenues of accommodation establishments during the pandemic, leading to major falls in revenue in the COVID-19 period (Sigala, 2020; Huser et al., 2022; Polemis et al., 2023). In a multitude of company closures, those that persisted faced higher expenses in procuring hygiene and cleaning supplies for preventive measures. The hotel business particularly, and the food services sector in general, had substantial labour shortages and grappled with creating favourable working environments and retaining workers (Chang & Chang, 2021). To tackle these difficulties, the hotel sector is progressively integrating robots and artificial intelligence into business operations. According to projections, around 25% of hospitality occupations in the United States will be mechanised, utilising service robots by the end of 2030 (Bowen & Morosan, 2018). Given this increasingly growing role of AI in various industries, research that examines the impact of these technologies on people's well-being is needed. This study can provide valuable insights to guide the implementation of service robots.

Literature review

Naumov (2019) looks at how RAISA — robots, artificial intelligence and service automation — might affect hotel visitor experience and service quality. Five main service quality criteria — tangibility, reliability, responsiveness, assurance and empathy — are underlined in the research. Although service robots can improve the client experience, striking the ideal balance between digital and human interactions is still proving to be difficult (Huang & Rust, 2018). A good experience depends on establishing meaningful human relationships as technology cannot adequately portray events focused on human contact (Huang & Rust, 2018; Chiang & Trimi, 2020).

Front office service robots help with chores including luggage handling, check-in and check-out, and providing hotel and area attraction information. These robots use artificial intelligence to provide suggestions and answer queries, therefore improving

the customer experience by lowering waiting times and offering correct information (Bowen & Morosan, 2018). Service robots in restaurants effectively take orders, bring food and drink and clean tables. They move deftly to offer timely service and keep cleanliness (Wirtz & Zeithaml, 2018). Furthermore, in enhancing eating experiences, these robots' have the ability to recall dietary restrictions and consumer preferences (Huang & Rust, 2018).

From the first uses in manufacturing and entertainment to increasingly complicated tasks across several industries, the role of service robots in the service industry has changed dramatically (Wirtz & Zeithaml, 2018; Choi & Wan, 2021; Sun & Wang, 2022). Artificial intelligence and machine learning have improved robots' capacity for complex tasks and dynamic environment adaptation. Moreover, developments in natural language processing have greatly enhanced their capacity to provide high-quality consumer support (Huang & Rust, 2018). Improved sensors and advanced data analytics let robots offer individualised services, hence raising consumer happiness and operational effectiveness (Tuomi et al., 2021).

The hotel sector is using robots more and more for jobs including front-desk operations, housekeeping and concierge chores, thereby guaranteeing consistent and effective service delivery (Bowen & Morosan, 2018). Demonstrating their adaptability and great influence across many fields, robots are especially important in health care for patient care, drug distribution and surgical operations (Forgas-Coll et al., 2022). Customers' impressions of their human-like traits and the degree of trust they inspire determine how effective service robots are (Wirtz & Zeithaml, 2018; Choi & Wan, 2021). These robots provide psychological, psychological and pragmatic advantages that affect users' view of their usefulness and simplicity of use (Wirtz & Zeithaml, 2018; Choi & Wan, 2021).

Service robots may not be used, despite technical developments, depending on technology constraints and the requirements of human interaction. Negative client impressions, worries about staff job security and high turnover rates (Huang & Rust, 2018; Dwesini & Sisulu, 2019; Mariani & Borghi, 2023) provide further difficulties for the hotel sector. Although service robots offer psychological and pragmatic advantages that influence consumers' impressions of their value, it is imperative to investigate the negative aspects and constraints of these technologies, specifically in the hotel sector. Citing problems like a lack of empathy, restricted interaction skills and mechanical behaviour, which can distract from the whole experience, guests have complained of discomfort and displeasure with robots (Naumov, 2019; Forgas-Coll et al., 2022). Employees also voiced concerns about job security and the impersonal character of robots, both of which might affect morale and job satisfaction (Huang & Rust, 2018). These problems draw attention to the requirement for better knowledge of the elements causing these unfavourable opinions to guide improved plans for the design and use of service robots in the hotel sector.

Service robot integration in hotels offers both possibilities and difficulties; however, the careful balancing of technical developments with customer-centric services will help to maximise satisfaction. More research is required to evaluate how the inclusion of robots in employment affects guests and staff members.

Methodology

Research design
The study was carried out at a prestigious 4-star hotel situated in the southern region of the Netherlands. The hotel functions as a fully equipped establishment with total of 263 rooms and suites, 26 conference spaces and three restaurants that serve the needs of both local and international business and leisure customers.

Different types of data acquisition were done to collect data for this mixed-methods study to capture the intricacy of the investigated topic. Hotel guests were surveyed during checkout — thus keeping the survey as quick as possible — on demographic and study-related topics to acquire quantitative data. The poll assessed visitors' opinions using true/false questions, yes/no questions as well as a 5-point Likert scale from "strongly agree" to "strongly disagree". Using carefully planned questions to explore study themes, hotel employees were interviewed for qualitative data. By using quantitative and qualitative data, this approach can give a complete understanding of the study topic (Creswell & Plano Clark, 2018). For contextual correctness and relevance, the survey and interview instruments were specific to the hotel in this case study.

Participants
All interview participants were current hotel employees. Eight people, each from a different department, were asked to provide a variety of viewpoints about the hotel. This selection procedure guaranteed that knowledge from many operational areas was acquired, offering a complete picture of how different departments view and interact with robots. The technique facilitated a thorough understanding of the ramifications of robotic interactions in the hospitality sector). The survey study encompassed both business and recreational patrons who lodged at the 4-star hotel, with the objective of acquiring a comprehensive understanding of their preferences. During checkout, participants were selected to be representative of wider demographic features. (Bryman, 2016).

Data collection and analysis
A total of 48 individuals responded to the survey, while eight employees took part in extensive interviews. Two different data approaches were employed to augment the dependability and credibility of the findings (Denzin, 2012). Means, frequencies and percentages were used to summarise and interpret the survey data (Sullivan & Artino, 2013). Thematic analysis of qualitative data using interview transcriptions and coding revealed five key themes connected to hotel service robots (Braun & Clarke, 2006; Guest et al., 2013). For a complete picture of workers' AI service robot experiences, these themes included emerging sub-themes (Nowell et al., 2017).

Results

Based on the progressive integration of service robots and artificial intelligence in hotels, the study focused on: a) the influence of service robots on guests' hospitality experience and the extent of the influence; b) service preferences of the different type of guests; and c) the influence of service robots on different guests' repeat visits and the perception of different types of guests of the use of service robots at the front office. Below are the results of both the quantitative analysis and the qualitative analysis.

The impact of service robots on guests' hospitality experience
Out of the 48 participants, 42% (10% business visitors and 32% leisure guests) agreed that robots had a significant influence on their hospitality experience. Conversely, 31% of the participants (19% business visitors and 12% leisure guests) expressed disagreement, while 27% (6% business visitors and 21% leisure guests) remained neutral. While there was consensus about the impact of robots on the hospitality experience, significant differences were seen across different customer groups. For example, a mere 10% of business visitors recognised the influence of service robots on their hospitality experience, whereas a significant 32% of leisure guests noticed the impact. In terms of disagreement, 12% of leisure visitors said that service robots had no impact on their experience, suggesting that a bigger majority believed that robots did indeed have an influence. In contrast, 19% of company visitors did not perceive any impact from robots on their experience, suggesting that being served by a service robot was of little significance to them.

Employees observed that most tourists, especially children and international visitors, showed great enthusiasm towards the robots. They frequently took photographs and thoroughly enjoyed the novelty of the experience. As an illustration, a particular employee commented that '[t]*he majority of individuals enjoy it, particularly children and foreign visitors*". According to Employee 6 from the food and beverage department, guests are impressed by the robot and capture the event by taking photographs. Another staff member remarked that "[t]*he business guests highly appreciate it due to its innovative, novel and contemporary nature*". Nevertheless, staff also noted that senior patrons frequently had challenges with technology and experienced unease while being served by robots.

Comparison of the positive impact of service robots between business and leisure guests
The findings indicate that business visitors have a much higher positive effect score of 35% in the range of 60%–80%, whereas leisure guests only score 32% in the same range. Furthermore, leisure guests experience the highest level of positive effect, reaching 39% in the range of 40% to 60%. This surpasses the score of 24% for business guests in the same range. These findings suggest that business guests tend to provide more positive reviews compared to leisure guests, especially in the range of 60% to 80%.

Business visitors regard robots as improving service effectiveness and efficiency, as indicated by qualitative data, which is consistent with high positive influence ratings. Staff observed that business guests had a positive response to the inventive and contemporary nature of robots, which corresponds with their professional interests.

Negative impact of service robots on the hospitality experience
The research indicates that there is minimal disparity between the two types of guests. Both business and leisure customers provide the most unfavourable reviews in the region of 20% to 40%. Nevertheless, there is a significant discrepancy in the 0%–20% range, with 22% of the leisure tourists seeing a more prominent adverse effect in contrast to only 6% of the business guests. Employees identified many factors that contributed to their discontent with service robots. Leisure visitors frequently perceived the robots' absence of human touch and emotional involvement as causing encounters to appear

distant and impersonal. Business visitors, although valuing speed, occasionally found robots to be unhelpful in service scenarios that demanded sensitivity and comprehension. These observations indicate that both groups encountered certain forms of unease while using robot-assisted services, which comes from the robots' existing technological constraints and the requirement for human interaction in the hospitality industry.

Service preferences based on guest types
A significant majority of respondents (60%) indicated a preference for receiving assistance from a human being. This desire was expressed by 24 leisure visitors and five business guests. In contrast, a quarter of the participants, consisting of 11 business visitors and one leisure guest, expressed a preference for being attended to by a robot. In addition, 15% of participants expressed neutrality, signifying an absence of a distinct preference between being assisted by a robot or a person.

Qualitative research reveals the preferences by emphasising that business visitors like the efficiency and novelty of robots, whereas leisure guests and older generations prioritise personal connection. Employees noted that older patrons frequently experienced unease and doubt when being attended to by robots, expressing a preference for human interaction.

The impact of service robots on the frequency of return visits by various guests
To assess the impact of service robots on customers' likelihood to return, 67% of respondents — 25% business guests and 42% leisure guests — expressed a desire to revisit hotels that employ service robots. These findings indicate that service robots are widely accepted and viewed positively by both business and leisure clients.

Employees noted that although some customers were at first sceptical, many came to appreciate the robots after they grasped that the robots were intended to aid rather than supplant human staff. A staff member remarked that "[w]*hile guests do appreciate the robots, it is important for them to understand the underlying purpose behind their presence*". Employee 2 from the front office emphasised the importance of understanding that the robots are not meant to substitute personnel.

Perceptions of various guest types regarding the utilisation of service robots at the front desk
Business and leisure customers exhibited comparable average answers on the use of service robots at the front office. But business visitors had a stronger preference for using efficient robot-assisted check-in and check-out services.

The qualitative data corroborates these findings by demonstrating that business visitors like the efficiency and swiftness offered by robots, which corresponds to their requirement for prompt and efficient service. According to Employee 3 from the front office, business visitors considered the robots to be new and modern, which aligned with their professional routines and expectations.

Summary of results
Focusing on their effects on guest experiences, service preferences, repeat visits and front office impressions, the study investigated how service robots and artificial intelligence may be integrated in hotels. Of the guests — mostly leisure

visitors — 42% believed that robots really improved their experience, and 31% disapproved, mostly among the business travellers. Though business visitors valued the novelty and speed of robots, 60% of respondents preferred human service, and leisure guests preferred personal connection despite the effectiveness of the robots. Fascinatingly, 67% of all visitors said that they would be likely to return to hotels using service robots. Still, several issues were raised, especially among elderly customers who felt uncomfortable with robotic interactions, underscoring the continued requirement of human engagement in hotel operations. These results highlight the need of harmonising customer-centric service with technical innovation to maximise visitor pleasure.

Discussion

This research examined staff and guest experiences of service robots at a 4-star hotel in the southern Netherlands, focusing on front office practicality. Service robots affect customers' hospitality experience according to the quantitative and qualitative study. Business guests more than leisure guests report that service robots improve their service experience. Service robots give hotel workers the help they need. Even with service robots, corporate and leisure clients said they would return to a hotel. Both guest groups were willing to use front-office service robots. According to the report, some leisure and corporate customers and hotel personnel want service robots, justifying their use. The survey also stressed the importance of face-to-face greetings for visitor happiness.

The findings are consistent with Naumov's (2019) study on the hotel industry's struggle to combine technology and human ties. Since 60% of participants preferred human aid over robots, our data supports this conclusion. Leisure visitors stressed the significance of casual discussion between check-in and check-out, highlighting human ties. According to Wirtz and Zeithaml (2018), human interactions improve visitor experiences over time.

Service robots save costs and boost production, according to the study. It also shows that face-to-face communicators may object to their use. The 60% of participants who preferred human service challenged the idea that empathy and face-to-face encounters do not affect customer satisfaction (Bowen & Morosan, 2018).

Sixty-seven per cent of business and leisure clients are likely to return to hotels or restaurants that use service robots. This result contradicts Meidute-Kavaliauskiene et al. (2021), who suggested that modern technologies may frighten visitors, especially seniors. Although some elderly visitors may have misgivings, our survey found that guests are nevertheless likely to return to hotels with service robots.

This study has several major implications for the hotel. The hotel's target demographic's interest in modern technology — as shown by statements like *"utilising robots for check-in and check-out seems like a favourable idea"* and *"I would take advantage of the efficient check-in and check-out process facilitated by a service robot"* — supports the front office robot suggestion. The management can easily integrate this new robot as they had bought two for the food and beverage department. Transitions to robot services should avoid removing the human element at the front desk. Human relationships, especially with leisure tourists, continue to make guests happy. Human-staffed

hotel receptions are better at handling guest complaints and increasing customer satisfaction. A successful hotel firm must balance technical development and personal connections. Service robots boost production and cut costs. Successfully integrating these elements involves a careful balance between technology enhancements and visitors' basic human needs. This study shows that service robots in hospitality require a tailored strategy that takes client preferences and expectations into account.

The 60% of respondents who chose human service brought into question the theory that customer happiness is unaffected by empathy and in-person meetings (Bowen & Morosan, 2018). Moreover, knowing the reasons of discontent or discomfort with robots might help to direct better designs and implementation plans. The main causes of poor experiences were the absence of individualised engagement, the supposed coldness of mechanical service and sporadic technical problems upsetting service flow. Gupta et al. (2022) found that aligning technological installations with visitor expectations improves service experiences. To ensure visitor satisfaction and effective complaint handling, Huang and Rust (2018) recommend prioritising the human element at the front desk while integrating robot services.

Limitations and future research

This study, which attempted to give first findings and ideas on a modern and fast-changing subject, has various limitations. There are a limited number of participants due to a small sample size and a narrow geographical scope that focuses just on one hotel. Moreover, the study's results may not be completely applicable to other situations because of the distinct attributes of the hotel being examined in this case study. To improve understanding, future studies should examine the correlation between demographic factors (such as age, education and gender) and the encounters of various individuals with service robots. To enhance the study's depth, including hotels of diverse sizes and geographical settings, together with distinct cultural backgrounds, may yield more extensive and transferable findings. In addition, long-term studies might investigate the enduring effects of service robots on visitor satisfaction and operational efficiency.

Conclusion

This research emphasises the crucial role of service robots in enhancing hospitality environments, while also emphasising the need for maintaining human interactions to guarantee guest satisfaction. The study finds a distinct difference in guest preferences: business travellers prioritise effectiveness and modern features, whereas leisure guests value social interactions and personal involvement. This difference underscores the importance of adopting a well-rounded strategy when incorporating robots into the hospitality industry.

The hotel is expected to gain substantial benefits from the use of service robots, with the most prominent one being cost reduction. Service robots decrease the necessity for extra personnel and function with far more efficiency by managing repetitive chores like cleaning tables and transporting plates. From an economic standpoint, the yearly expense of a service robot, when distributed over its whole operating life, is considerably cheaper in comparison to the costs associated with employing people. Moreover, service robots enhance the

well-being of staff members by relieving work-related stress, enhancing overall efficiency and reducing absenteeism.

From the standpoint of visitor experience, although the preset paths of service robots may sometimes result in minor issues, both business and leisure customers typically feel a favourable effect on their pleasure. Although there may be difficulties navigating the use of robots, visitors have shown a willingness to come back to the hotel, demonstrating a widespread acceptance and appreciation of the use of service robots.

To summarise, the integration of artificial intelligence in service robots has had a beneficial impact on the overall satisfaction of hotel guests. The results indicate that although new technology offers significant advantages, it is crucial to preserve human interactions to fulfil the various demands of guests. The lessons from this study can be beneficial for guiding the future use of service robots in the hotel industry. They can promote a careful balance between innovation and personalised service. It is recommended to further investigate the deeper emotional and psychological effects of encounters with robots. This research will also help improve the design and implementation techniques of robots to better cater to the demands of guests and employees.

Key takeaways

- *Preference for human interaction* — Even though service robots are useful and interesting, both business and leisure guests strongly prefer to interact with real people. Leisure guests especially value the personal touch and emotional connections that human staff offer.
- *Efficiency versus personalisation* — Business guests like how modern and efficient service robots are; they see them as ways to improve service delivery. But a lot of guests, especially older ones, think robots are impersonal and do not make the emotional link that is so important to a good hosting experience.
- *Concerns and limits of employees* — The people who work in hotels have mixed views about service robots. Even though workers know that robots can help with repetitive chores and make the business more efficient, they are worried about their job security and the fact that robots do not have a human touch, which can lower guest happiness and employee morale.
- *Need for better robot design and integration* — The study shows how important it is to make service robots that are better built so they can fix the problems that make people unhappy, like not being able to connect with people well or showing empathy. Integration tactics that work should make sure that robots work with human staff instead of replacing them.

ORCIDs

Frederik Jan van der Meulen – 0009–0005–7150–3638
Juliet Chipumuro – 0000–0001–6792–9488
Wilson Majee – 0000–0003–1726–0979

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