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Service Management in the Age of AI and Robotics

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Employee Responses to Robots in Hospitality

In the age of artificial intelligence, the power of service robots in the hospitality industry to increase productivity and deliver superior customer value is hotly debated. Using a qualitative exploratory approach, this study examines how service employees perceive and interact with a service robot and how this affects customer service interactions.

Prof. Dr. Kristina Kleinlercher, Margaretha Hackett

In the hospitality sector, technology is taking over tasks in all kinds of different areas, including reservations (Wu et al., 2015), check-in, customer service, and even the use of augmented reality (Tussyadiah et al., 2018). The working environment in the hospitality industry is being disrupted by a new service entity, the service robot (Huang et al., 2021). The global service robotics market is projected to reach USD 33.5 billion in 2024 (Statista Market Insights, 2023). In hospitality, the International Federation of Robotics counted 24,500 robots sold in 2022 (IFR, 2022). The power of service robots in the hospitality industry to increase productivity and deliver superior customer value is being hotly debated (Wirtz et al., 2018). Experts predict that service robots will soon become a standard part of the service experience (Mende et al., 2019). Research shows that hybrid teams of frontline service employees (FSEs) and service robots (SRs) are currently the most efficient, but only if FSEs accept and know how to work with SRs (Paluch et al., 2020). For this reason, studying the acceptance and response of FSEs to SRs and their integration into service delivery is central to understanding human-robot interactions (Noble et al., 2022). Unfortunately, research on this topic is scarce (Lu et al., 2020). Building on this gap, this research draws on the Unified Theory of Acceptance and Use of Technology and the Uncanny Valley Theory to examine how FSEs respond to and accept SRs in the hospitality industry, and how SR integration affects customer service interactions.

Acceptance of Service Robots in Hospitality

According to Wirtz et al. (2018, p. 909), service robots are defined as “system-based, autonomous, adaptive interfaces that interact, communicate, and provide services to an organization’s customers.” SRs are already being tested in various hospitality services around

the world, such as robot butlers (Aloft Hotel in Cupertino, USA), robot travel assistants (SARA, Singapore’s Automated Responsive Assistance, Singapore), robot baristas (Smyze, Switzerland), robot waiters (Freshippo, China), or robot receptionists (Henn na Hotel, Japan). However, many of these applications are still in the pilot phase, and SRs are generally perceived as suitable only for simple, repetitive, and tedious tasks (Lee et al., 2021). Human employees are often seen as the sole enablers of a company’s competitive positioning (Wirtz et al., 2018). Their friendly demeanor, empathy, and out-of-the-box thinking are described as something that cannot be replaced by SRs, which are perceived as unsuitable for complex and high-value services (Fuentes-Moraleda et al., 2020).

Due to fear of the unknown, initial skepticism or even rejection of SRs by FSEs in the hospitality industry is quite common, and FSEs tend to expect SRs to create more additional work than they support (Lu et al., 2019). Lack of training and information on how to efficiently integrate SRs into work processes is another factor that shapes FSEs’ resistance to SRs (Ivanov et al., 2022). The Unified Theory of Acceptance and Use of Tech-

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nology (UTAUT) identifies critical factors that influence employees’ acceptance of new technologies, such as SRs (Venkatesh et al., 2003). Although the factors of UTAUT, namely effort expectancy, social influence, facilitating conditions, and performance expectancy, have already been studied in some cases of SRs in hospitality (e.g., Ivanov et al., 2022; Lu et al., 2019), the understanding of how and under what conditions FSEs are more likely to accept and integrate service robots in hospitality is still fragmented. In addition, there is little knowledge on how best to design the visual appearance of SRs to promote their acceptance. The Uncanny Valley Theory (UVT) explores the balance between human affinity for robots and their resemblance to humans in design, behavior, and appearance (Mori et al., 2012). While increasing human resemblance in robots can initially increase affinity, there is a tipping point where perceived human resemblance becomes uncanny, known as the uncanny valley, leading to robot rejection (Mori et al., 2012). Studies such as that by Lu et al. (2019) support the UVT in hospitality, highlighting that the human appearance of robots can trigger rejection due to a perceived threat. However, little is known about how to design robots in

service interactions to increase their attractiveness and human appeal without making them seem creepy (Park et al., 2024).

The interplay between SRs and FSEs offers new opportunities for hospitality organizations, such as the ability to address employee deficiencies, promote work efficiency, reduce repetitive tasks, and increase job satisfaction. Noble et al. (2022) state that SRs and FSEs should collaborate and work together for an optimal output. However, in order to implement robots and leverage FSE–SR collaboration, and to be aware of the changing factors in the hospitality industry, we need to understand how FSEs respond to SR integration. By better understanding the factors that drive human acceptance of technology (UTAUT) and by shedding light on the most promising visual appearance of SRs to achieve higher acceptance rates (UVT), organizations can take targeted actions to promote collaboration in environments that combine FSEs and SRs (Prassida & Asfari, 2022).

Data Collection and Analysis

In response to calls from previous research for a more systematic approach to studying employee responses to robots (Paluch et al., 2022), this research employs a qualitative single case study methodology in the hospitality industry. The study aims to understand the complex and contextual conditions surrounding FSE–SR interactions.

The case study focuses on a renowned five-star luxury hotel in the DACH region. The hotel is known for its exceptional customer service and its well-trained and highly committed FSEs. The hotel is actively involved in innovation and new technologies and has been collaborating with technology partners for many years. In this vein, the hotel has integrated an SR into its operations to

improve the guest experience and the efficiency of the FSEs. The SR is seamlessly integrated into the restaurant service for breakfast, lunch, and dinner, providing unique support to FSEs (e.g., by bringing empty dishes to the kitchen) and a technologically advanced guest experience. The robot is 1.3 meters tall, moves on wheels, and has a round shape with an open back where employees can place

“I think you have to make a clear distinction between humans and robots.”

empty dishes. It has no legs or arms but blue lights in the form of eyes that can blink. The robot also has the ability to understand speech and to talk, but the hotel management decided not to use this feature. The hotel’s initiative to employ the SR challenges the conventional perception of SRs as only suitable for simple tasks but not for the complex, high-end services (Lee et al., 2021) that are often required in luxury hotels.

Management Summary

Technology, including service robots, is reshaping the hospitality sector, with debates about their role and potential becoming increasingly prominent. Frontline service employees have a complex relationship with service robots, blending humanization and dehumanization depending on the circumstances. While service robots offer efficiency and support in customer service interactions, employees express concerns about their impact on job roles and the authenticity of the guest experience.

The data used in this study was collected through a comprehensive approach. Thirteen in-depth interviews were conducted with FSEs who had actively interacted with the SR in the hotel for at least three months (ID 1 – ID 13). Following a purposive sampling strategy (Patton, 1990), the employees interviewed were constantly confronted with the SR in their daily tasks and had also experienced working without the robot prior to its deployment. To account for different perspectives on the SR, the FSEs interviewed held different positions in the restaurant, ranging from chef de rang to trainee. The interview guide was divided into three sections. The first section is based on the UVT and includes questions that assess the FSEs’ perceptions and feelings about the SR’s appearance. The section of the questionnaire based on the UTAUT explores the benefits and challenges associated with working with the SR from the perspective of the FSEs and their attitudes, expectations and evaluations of how employee–robot, customer–robot, and customer–employee interactions would be and actually have been affected by the integration of the SR. The final section focuses on questions about the FSEs’ perceptions of the future role of SRs in the hospitality industry. The interviews were conducted face-to-face, recorded and transcribed, and lasted on average 35 minutes. In addition to the interviews, observations, and documentation of customer service interactions in the hotel, both with and without the presence of the robot, were conducted in the spring of 2023. The observations totaled nearly 150 different service interactions and 30 pages of field notes.

This research uses Lincoln and Guba’s (1985) multi-step categorization process to analyze the case data. This method involves identifying similarities between text passages from the interview transcripts and the field notes in order to create categories. As a first step, both authors repeatedly read the transcripts sen-

tence by sentence to identify recurring themes (Jörling et al., 2019). These themes and their associated descriptive codes were then condensed into abstract codes in step 2. In step 3, the authors refined and consolidated these abstract codes. In total, four abstract categories with two subcategories each were identified. Each category and subcategory, as well as sample quotations, will be presented in the following.

Results

Employee Perception of the Service Robot

FSEs highlight various characteristics that set them apart from SRs, such as their ability to smile and give advice (ID 2), adaptability to situations (ID 4), communication, eye contact, facial expressions, and gestures (ID 6), and the presence of moods and daily dispositions (ID 10). Still, they acknowledge the advantages of robots, jokingly referring to them as the “best employees” due to their tirelessness, lack of need for breaks, and absence of negative attitudes (ID 6). FSEs exhibit a nuanced relationship with the robots, blending humanization and dehumanization.

Dehumanization. The interviews revealed that service employees are typically more willing to work with hospitality SRs when they are less anthropomorphic and focus primarily on support tasks. To achieve this, they actively engage in a kind of dehumanization of the service robot, emphasizing its role as a mere machine or “just a service trolley” (ID 6) rather than a substitute for human service among colleagues and customers. They deliberately disable human-like characteristics, such as speech and expressive eyes, to reinforce this perception. This deliberate dehumanization is evident in their quotes: “It doesn’t talk ... we turned that off,” (ID 1) and “We had to turn [the eyes] off

Main Propositions

- 1 Employee perception: Service workers see robots as efficient helpers but lacking human characteristics.
- 2 Humanization vs. dehumanization: Employees vacillate between treating robots as tools and as colleagues.
- 3 Initial discomfort with SR integration is followed by acceptance through trial and adjustment.
- 4 Gradual customer acceptance of SRs leads to improved employee–customer engagement.

... the kids were too attracted to them” (ID 2). They value functionality over anthropomorphism: “We don’t want the SR to have cat eyes ... keep it as simple as possible” (ID 6). They also program it to avoid people on its routes (“It moves out of your way.” (ID 3)), so that people do not realize it is there. This approach aims to maintain clear boundaries between human and machine roles, emphasizing the robot’s assistive function rather than its potential to mimic human interaction. As one chef de rang explains: “I think you have to make a clear distinction between humans and robots. And I don’t think you have to make it look like a human” (ID 12).

Humanization. However, amidst this dehumanization, service employees also humanize the robot on certain occasions. Every FSE showed some sort of humanization when interacting with the robot. They affectionately nickname it – several service employees gave it the name of a retired colleague to indicate

that it is also part of the team (ID 1, 2, 12). They even anthropomorphize its actions, describing errors as if it were under stress and having a hard day. For instance, someone mentioned, “When it made a mistake, it had glowing red crosses as eyes, so people always thought it was dead or something” (ID 7). They also refer to its physical movement as human, saying something like, “Then it could no longer walk” (ID 7), though it only moves on wheels. This illustrates the FSEs’ tendency to view the robot as a living entity capable of experiencing emotions (“We think it has feelings,” ID 12). In their interactions, they speak to it as if it were a person, reinforcing a sense of camaraderie within the team.

Employee–Robot Service Integration

Implementation and learning. The sudden appearance of the robot, without a lot of prior warning from management, left some employees feeling unsettled (ID 6). The integration of the robot led to a period of trial and error. Uncertainties about optimal routes and usage patterns emerged, leading to continuous experimentation and adaptation (ID 1, 6). Over time, clear rules were established, facilitating the robot’s integration into team dynamics and sparking an interplay between staff and technology (ID 7). Adaptation extended to individual behaviors, prompting employees to re-evaluate established norms to accommodate the robot’s presence (ID 2). This is exemplified by one trainee’s comment: “As a waiter you should never leave empty-handed. But with the service robot, sometimes you even have to look for dishes because it works so thoroughly” (ID 7).

At the time of implementation, employees were apprehensive about being replaced by the SR. One FSE (ID 1) admits that she was worried about the robot taking her job. Concerns went

beyond job security; some employees feared the loss of the hotel's character with the introduction of a robot (ID 2). In addition, employees struggled with feelings of surveillance, imagining scenarios in which the robot's presence implied surveillance by management (ID 7). However, as they interacted with the robot and experienced its assistive capabilities, perceptions shifted. The robot evolved from a perceived threat to a valued asset (ID 2).

Lack of leniency toward the robot. Employees were less forgiving of service robots than they would have been of human counterparts. As one FSE (ID 7) describes, frustrations can mount when the robot seems to thwart attempts to navigate around it: "If you want to get out of its way, it goes in the direction you're going, then if you try to get out of its way again, it goes in that direction again and stands in front of your feet, and at some point you start swearing like it is a person: 'Can't you just get out of my way?'" Another employee (ID 9) points out that the robot's quiet movements, which are normally an advantage, can sometimes startle guests. Additionally, one employee (ID 7) expresses envy of the robot, noting, "It's really cheeky that the guests make way for the service robot, but not for us." All of this reveals a tendency among FSEs to treat the robot more carelessly than they would a human counterpart (ID 12): "If it were a human, I think we would be more careful with it."

Impact of Employee–Robot Interactions on the Customer

Gradual acceptance. Initially, customers were skeptical about the SR. However, as they observed its efficient service and helpfulness, curiosity arose, leading to inquiries about its functions and purpose. As one employee recalled, "Customers were skeptical at first. When the robot first appeared, one regular

customer said, 'Now it's over, now the robots are here.'" (ID 2). Interestingly, the younger generation "embraced the service robot wholeheartedly and found it to be a highlight" (ID 6). Gradually, adults warmed to the robot as well, with some even greeting it by name. "So now they really say, 'Good morning, Robi!'" (ID 7). One FSE mentioned that the guests' fascination faded over time, as the novelty of the robot wore off after 2–3 days and it became a familiar part of the restaurant landscape (ID 13).

Improved interactions. The robot continued to serve as a valuable asset, facilitating smoother interactions between employees and customers. As employees noted, "Using the robot makes it easier to connect with guests and start a conversation" (ID 7) "because they ask questions and then you can answer them quickly" (ID 1). Due to the robot's assistance, employees have

more time to engage with customers, make recommendations, and improve the overall dining experience. As one chef explained: "The relationship with the guest has evolved in such a way that the guest gets more from the employee because the employee no longer has to be in the kitchen and can spend more time with the guest" (ID 2). Another employee mentions that the SR embodies "how the hotel treats its employees" (ID 13). Similarly, another FSE mentions: "You can explain to guests that the company has invested in its team" (ID 6).

The Future of Robots in Hospitality

Supporting function. While many critical service interactions still rely heavily on human interaction, FSEs recognize the value of SRs in helping them deal with stressful situations. As one employee shares: "When there's a lot of work and our guests are demanding. In those stressful moments, I tend to get nervous and impatient, while the SR doesn't feel stressed and strained by people standing in the way and preventing us from doing our job. Then the SR helps me" (ID 3). However, amid discussions of automation and technological advancements, all employees emphasize the irreplaceable expertise they currently bring to the table: "Our expertise sets us apart from other hotels ... We cannot be replaced by service robots" (ID 13).

Unrealized potential. Employees recognize the vast untapped potential of SRs, signaling the beginning of a transformative journey: "The journey is just beginning ... we are actually using only a third of what it can do" (ID 2). Several employees express concern about the impact on future generations and the loss of genuine warmth in guest interactions: "We are not used to service robots at the moment, but it may become the new normal for the next generation. They won't know that smiling or greet-

Lessons Learned

- 1 Hospitality management must navigate the evolving landscape of technology integration, balancing the benefits of service robots with employee concerns.
- 2 Managers should facilitate clear communication and provide training to help frontline employees effectively collaborate with service robots while preserving authentic guest interactions.
- 3 Addressing employee concerns about job security and maintaining authentic guest experiences is crucial for the successful integration of service robots into hospitality operations.

ing guests is normal. So, I'm really worried about what the hospitality industry will look like in a few years with these robots" (ID 7).

Discussion

Consistent with previous research (Seyitoğlu & Ivanov, 2020), findings from the single case study suggest a nuanced approach to service delivery, emphasizing the synergy between employees and robots. In accordance with the UVT (Mori et al., 2012), FSEs expressed discomfort when the robot displayed too human-like characteristics, such as eye movements. FSEs were more willing to collaborate with the robot when it was primarily focused on support tasks, and they went to great lengths to let others know that the SR is "just a machine." FSEs remained skeptical of the robot's capacity for empathy (Yun et al., 2021) and did not recommend its direct interaction with customers in the near future. Nevertheless, all FSEs reported some efforts to humanize the robot by attributing human characteristics to it, such as fatigue or stress. Over time, it remains to be seen whether FSEs will become increasingly accustomed to and accept SRs presented in more anthropomorphized formats, potentially facilitating the traversal of the "uncanny valley" toward a more human-like representation of SRs (Mori et al., 2012).

Consistent with the performance expectancy of UTAUT (Venkatesh et al., 2003), we find that FSEs expected the SR to help them do their jobs better. When the FSEs ultimately found that the SR was indeed a great help, enabling them to spend more time with the customer, their acceptance of the SR increased. Building on the UTAUT, we also found instances of social influence in our data. For instance, one FSEs explicitly mentioned that her acceptance and behavior with the SR was influenced by other team members ("I pet him and say, 'You've been good

again.' Almost everybody does that around here" (ID 11)).

This study explores the adoption of service robots in the hospitality industry, extending the UTAUT and UVT. However, due to the still limited presence of SRs in hotels, its scope is limited to a single-case approach, which compromises

its generalizability. To improve this, future research should examine SRs in different hotel categories and in less up-scale environments where the potential for automation is more pronounced. In addition, further research should examine customer perceptions of SRs in the hospitality sector and their impact on the FSE–customer relationship. ■

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