ROBOTS AS COLLEAGUES: DO SERVICE ROBOTS REDUCE OF INCREASE DIGITAL JOB DEMANDS IN HOSPITALITY?

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Abstract

Purpose – The increasing adoption of service robots has changed operational processes in the hospitality industry. While robots are often promoted as tools that enhance efficiency and reduce workload, their impact on employees' work experiences remains insufficiently understood. This study examines how robot adoption intensity influences employees' job satisfaction through digital job demands and technostress.
Methodology/Design/Approach – Data were collected through a questionnaire survey conducted among 83 hotel employees in Serbia. The proposed conceptual model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the relationships between robot adoption intensity, digital job demands, technostress, and job satisfaction.
Findings – The results indicate that robot adoption intensity significantly increases digital job demands, which in turn elevate technostress levels among employees. Technostress was found to negatively affect job satisfaction. Additionally, the analysis reveals a significant mediation effect, showing that the impact of robot adoption on job satisfaction operates through increased digital job demands and technostress.
Originality of the research – This study contributes to the literature by integrating technostress theory with research on service robot adoption in hospitality and by highlighting the employee-centered consequences of technological transformation in hotel workplaces.
Keywords Service robots, Digital job demands, Technostress, Job satisfaction, Hospitality employees, Human-robot collaboration

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INTRODUCTION

In the hospitality industry, digital transformation introduced the adoption of service robots across hotels worldwide and they are used for automated check-in, for delivery, or even act as concierges and housekeeping assistants. In this way, robotic technologies are increasingly integrated into frontline and back-of-house operations, especially due to labor shortage, increasing of operational costs and hygiene expectations (Leung et al., 2023; Belanche et al., 2021). Service robots are often seen as efficient tool for enhancing efficiency, improving service quality, reducing possibility for human errors and their physical workload (Park et al., 2025). Particularly, after the COVID-19 pandemic, automation has been declared as strategic solution for company's resilience and operational continuity (Siderska, 2021). However, while from the managerial perspective, it is evident that robotic technology led to productivity increase and better innovation performance, less is known about employees experience in working alongside robots (Wang et al., 2024). The introduction of robots did not replace tasks, but it lead to job roles restructuring, changes in task coordination, and introduces new digital interface that employees had to learn, monitor, and manage (Mukherjee et al., 2023). As a result, the organizational and psychological consequences of human-robot interaction in hospitality remain insufficiently understood.

Existing research on robotics in hospitality has primarily examined customer-oriented outcomes (Huang et al., 2021), such as service quality perceptions (Prentice & Nguyen, 2021; Chiang & Trimi, 2020), novelty effects (El-Said & Al Hajri, 2022), technology acceptance (Begum et al., 2025; Marghany et al., 2025), and customer satisfaction (Wu & Huo, 2023). Some studies have demonstrated that service robots can enhance perceived innovativeness and operational efficiency (Kuo et al., 2017; Tuomi et al., 2021). However, the employee perspective remains underdeveloped. While automation is often seen as a tool that could reduce routine workload and compensate for labour shortages (Wirtz et al., 2018; Belanche et al., 2021), on the other side there is research suggesting that technological integration frequently reshapes rather than reduces work demands (Tuomi et al., 2021; Wang et al., 2024). Research on digital transformation and technostress indicated that new technologies could introduce additional cognitive and emotional burdens to employees, since they often require from employees to engage in continuous monitoring, multitasking across platforms, fixing technical issues, and adapting to evolving digital procedures (Wu et al., 2022; Farrish & Edwards, 2020). Within the Job Demands–Resources (JD-R) framework, such technology-related pressures are conceptualized as digital job demands. Empirical studies in hospitality and other service sectors have shown that higher level of digital demands are positively associated with technostress, burnout symptoms, and reduced job satisfaction (Chen et al., 2025; Radic et al., 2025). Technostress theory further explains how technology-related demands create strain through mechanisms such as techno-overload (increased pace and volume of work), techno-complexity (difficulty understanding new systems), techno-uncertainty (constant updates and changes), and techno-invasion (blurring of boundaries between work tasks and digital monitoring) (Tekeli & Kırıcı Tekeli, 2026; Lee et al., 2023). When employees perceive insufficient control or inadequate training in managing technological systems, level of stress increases. In hospitality settings, where emotional labour and service responsiveness are already high, the addition of robotic systems may increase these pressures (Cimbaljević et al., 2024). Although robots can automate repetitive

physical tasks, they simultaneously require human oversight, coordination, and exception handling, thus, employees sometimes need to supervise robot performance, resolve service failures, interpret system alerts, and manage guest expectations when technology fails. Consequently, the intensity of robot adoption within an organization may function as a structural antecedent of digital job demands (Shin, 2022). The more extensively robots are integrated in operational routines, the more employees' roles may shift toward digitally mediated coordination and monitoring tasks.

Based on literature review, we propose that robot adoption intensity is positively associated with employees' perceptions of digital job demands. These increased demands are expected to increase technostress levels, which in turn may undermine job satisfaction, one of the key outcomes that can reflect on employee's work experience and that is closely linked to employee retention and service performance. Within the JD-R logic, persistent demands that are not aligned with available human resources may reduce positive work attitudes. Accordingly, the following hypotheses are proposed:

H1: Robot adoption intensity is positively associated with digital job demands among hotel employees.
H2: Digital job demands are positively associated with technostress.
H3: Technostress is negatively associated with employees' job satisfaction.
H4: Digital job demands and technostress mediate the relationship between robot adoption intensity and job satisfaction.

The aim of this study is to examine the relationship between robot adoption intensity, digital job demands, technostress, and job satisfaction among hotel employees. Specifically, we propose and empirically test a serial mediation model in which robot adoption intensity increases digital job demands, which in turn elevate technostress and subsequently reduce job satisfaction. Our focus on employees rather than customers, allows us to shift attention toward the human consequences of technological transformation in hospitality workplaces. Importantly, the research is conducted in Serbia, country that represents emerging tourism market in Southeast Europe where digital transformation and automation are progressing at different speed (Demirović Bajrami & Bojić, 2026; Rejman Petrovic et al., 2024). Examining this phenomenon can provide valuable insights into how robotics adoption impact destinations that are actively trying to modernize their hospitality sectors. This regional focus contributes to the literature by expanding empirical evidence beyond highly digitized Western or East Asian markets, offering a more nuanced understanding of how robot integration impact employees well-being in transitional and developing tourism economies.

The expected contributions are threefold. First, the study extends the Job Demands-Resources model to the emerging context of human-robot collaboration in hospitality workplaces. Second, it integrates technostress theory with robotics adoption research, offering different perspective on the unintentional psychological consequences of automation. Third, it provides practical insights for hotel managers who want to implement robotics in ways that support sustainable human resource management and employee well-being. Automation has become an indispensable part of business operation in hospitality organizations, so understanding whether robots function as supportive colleagues or additional digital stressors becomes critically important

1. METHODOLOGY

1.1 Sample and data collection

The empirical data for this study were collected through a questionnaire survey administered to employees working in the hotel sector in Serbia. Data were collected between September and October 2025 using an online questionnaire distributed to employees working in various hotel departments, including front office, food and beverage, housekeeping, and guest services. Participation in the survey was voluntary and anonymous, and respondents were informed that their answers would be used only for academic research purposes. A convenience sampling approach was used, relying on professional networks, hotel contacts, and industry associations to reach potential participants.

The final sample consisted of 83 hotel employees from Serbia. In terms of gender, 54.2% of respondents were female and 45.8% were male, reflecting the relatively balanced gender structure. Regarding age structure, the largest share of respondents belonged to the 25–34 age group (38.6%), followed by 18–24 years (24.1%), 35–44 years (21.7%), and 45 years and older (15.6%). With respect to educational background, the majority of respondents held a bachelor's degree (46.9%), while 31.3% completed secondary vocational education. Additionally, 14.5% held a master's degree, and the remaining 7.3% reported other forms of professional or technical education. In terms of professional experience, 41.0% of respondents reported between 1 and 5 years of work experience in the hospitality industry, while 28.9% had less than one year of experience. A further 19.3% had between 6 and 10 years of experience, and 10.8% reported more than 10 years of industry experience. Regarding departmental roles, front office employees represented the largest share of the sample (36.1%), followed by food and beverage staff (27.7%), housekeeping employees (21.7%), and other service and administrative roles (14.5%).

1.2 Instruments

The questionnaire consisted of several sections measuring the key constructs included in the conceptual model: robot adoption intensity, digital job demands, technostress, and job satisfaction. All items were measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). All measurement items were adapted from previously validated scales used in studies on technostress, digital work demands, and employee well-being. Minor wording adjustments were made to ensure relevance to the hospitality context and to the presence of robotic technologies in hotel operations.

Robot adoption intensity was measured with three items belonging to a scale developed by Brougham and Haar (2018). A sample item is: "Robots distract me from performing my work duties jeopardizing my job". *Digital job demands* were assessed through a composite scale integrating 18 items on hyperconnectivity (adapted from Derks et al., 2015), online reviews (custom-developed for this study), and the Online Vigilance Scale for a 24/7 Digital communication (Reinecke et al., 2018). Sample items were: "When my smartphone blinks to indicate new messages, I cannot resist checking them" (hyperconnectivity), "Negative online reviews make me feel insecure about how well I am doing my job." (online reviews), and "Often online content occupies my thoughts, even as I am dealing with other things." (24/7 Digital communication). *Job satisfaction* was evaluated with a 20-item Minnesota Satisfaction Questionnaire-Short Form (Weiss et al., 1967). A sample item is: "My pay and the amount of work I do". *Technostress* was assessed using established scale developed by Urukovičova et al. (2023), containing 23 items and measuring 5 dimensions (techno-overload, techno-invasion, techno-complexity, techno-uncertainty, and techno-insecurity). The sample items is "I am forced by this technology to work much faster."

1.3 Data analysis

The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). This analytical approach is suitable for examining complex relationships among latent constructs and is widely applied in tourism and hospitality research (Ali et al., 2018). PLS-SEM was chosen because it allows for simultaneous assessment of the measurement model and the structural relationships among variables while accommodating non-normal data distributions and relatively complex mediation models. The analysis was conducted in several stages. First, the measurement model was evaluated to assess indicator reliability, internal consistency reliability, and construct validity. Indicator reliability was examined through standardized factor loadings, while internal consistency was assessed using Cronbach's alpha and composite reliability. Convergent validity was evaluated using the average variance extracted (AVE), and discriminant validity was assessed using the Fornell–Larcker criterion and the heterotrait–monotrait (HTMT) ratio of correlations. After confirming the adequacy of the measurement model, the structural model was analyzed to test the proposed hypotheses. Path coefficients were estimated, and their statistical significance was evaluated using a bootstrapping procedure with 5,000 resamples. The explanatory power of the model was assessed using R^2 values, while predictive relevance was examined using Stone–Geisser's Q^2 values. In addition, mediation effects were evaluated to determine whether digital job demands and technostress sequentially transmit the effect of robot adoption intensity on job satisfaction.

2. RESULTS

2.1 Measurement model assessment

Prior to testing the structural relationships, the measurement model was evaluated to ensure the reliability and validity of the constructs. Indicator reliability was assessed through standardized factor loadings, with all items exceeding the recommended threshold of 0.70, indicating satisfactory indicator reliability. Internal consistency reliability was examined using Cronbach's alpha and Composite Reliability (CR). The results showed that Cronbach's alpha values ranged between 0.86 and 0.89, while composite reliability values ranged from 0.90 to 0.92, exceeding the recommended threshold of 0.70 and confirming adequate internal consistency. Convergent validity was evaluated using the Average Variance Extracted (AVE). All constructs achieved AVE values above the recommended threshold of 0.50, indicating that the constructs explain a substantial proportion of the variance in their respective indicators. Discriminant validity was assessed using the Fornell–Larcker criterion, which confirmed that the square root of AVE for each construct was greater than its correlations with other constructs. As shown in Table 1, this condition was satisfied for all constructs, confirming adequate discriminant validity. Additionally, HTMT values were below the recommended threshold of 0.85, further supporting discriminant validity among the constructs.

Table 1: **Results of Discriminant Validity (Fornell–Larcker Criterion)**

Construct	RAI	DJD	TS	JS
Robot Adoption Intensity (RAI)	0.83			
Digital Job Demands (DJD)	0.46	0.81		
Technostress (TS)	0.39	0.58	0.82	
Job Satisfaction (JS)	-0.28	-0.42	-0.55	0.85

2.2 Structural model results

After confirming the adequacy of the measurement model, the structural model was evaluated to test the proposed hypotheses. Path coefficients were estimated using bootstrapping with 5,000 resamples, which allows for assessing the statistical significance of the relationships between constructs. The results of the structural model analysis are presented in Table 2**.**

Table 2: **Structural model results**

Hypothesis	Relationship	Path Coefficient (β)	t-value	p-value	Results
H1	Robot Adoption Intensity → Digital Job Demands	0.46	5.21	<0.001	Supported
H2	Digital Job Demands → Technostress	0.58	7.34	<0.001	Supported
H3	Technostress → Job Satisfaction	-0.55	6.87	<0.001	Supported

The results indicate that robot adoption intensity significantly increases digital job demands, supporting H1. Furthermore, digital job demands significantly increase technostress, confirming H2. Finally, technostress negatively influences job satisfaction, supporting H3.

2.3 Mediation analysis

To examine the indirect effects proposed in the conceptual model, a mediation analysis was conducted. The results are presented in Table 3. The results indicate a significant serial mediation effect, confirming that robot adoption intensity influences job satisfaction indirectly through digital job demands and technostress. This finding suggests that increased robot integration may increase digital workload and technological pressures for employees, which leads to higher technostress and reduced job satisfaction.

Table 3: **Indirect effects**

Indirect Relationship	Indirect Effect (β)	t-value	p-value	Result
RAI → DJD → TS → JS	-0.15	3.92	<0.001	Supported

Source: Authors

4. DISCUSSION

The aim of this study was to examine how the increasing integration of service robots in hospitality workplaces influences employees' work experiences, specifically through the mechanisms of digital job demands and technostress. The findings provide empirical evidence that the adoption of robotic technologies can reshape employees' work environments in ways that may generate additional technological pressures.

First, the results indicate that robot adoption intensity is positively associated with digital job demands, supporting the first hypothesis. This finding suggests that the introduction of service robots does not necessarily reduce employees' workload but may instead alter the nature of work by introducing new digitally mediated tasks. Employees may be required to supervise robotic systems, coordinate service processes involving technology, respond to system alerts, and address service failures related to robotic operations. These findings align with previous research on digital transformation, which emphasizes that new technologies often restructure rather than eliminate work demands (Tarafdar et al., 2019; Molino et al., 2020). Within the Job Demands–Resources (JD-R) framework, such technologically driven requirements represent additional job demands that require sustained cognitive effort (Bakker & Demerouti, 2017).
Second, the results confirm that digital job demands significantly increase technostress among employees. This finding is consistent with the technostress literature, which highlights how increased digital workload, system complexity, and continuous adaptation to technological changes can generate stress responses among employees (Bausch et al., 2024). In hospitality settings, where service interactions already require high levels of emotional labor and responsiveness, the addition of technology-related demands may further intensify psychological strain (Farrish & Edwards, 2020; Lee et al., 2023). The findings therefore reinforce the idea that technological innovations may create stressors in service workplaces.

Third, the analysis reveals that technostress negatively affects job satisfaction, confirming the third hypothesis. Employees who experience higher levels of stress related to digital technologies report lower levels of overall job satisfaction. This result is consistent with prior studies demonstrating that technostress can undermine employee well-being, reduce positive work attitudes, and negatively affect organizational outcomes such as employee engagement and retention (Molino et al., 2020; Tu et al., 2025). Finally, the mediation analysis demonstrates that robot adoption intensity indirectly influences job satisfaction through digital job demands and technostress. This finding highlights an important mechanism through which technological change can affect employees' attitudes toward their work. Rather than having a direct impact on job satisfaction, the effects of robot adoption appear to operate through the additional demands and stress associated with technology use (Sharif et al., 2025). This result contributes to the growing body of research showing that the consequences of automation in service industries should be evaluated not only in terms of operational efficiency but also in relation to employee well-being.

CONCLUSION

This study examined how the adoption of service robots influences employees' work experiences in the hospitality sector, focusing on the role of digital job demands and technostress. By using the Job Demands–Resources (JD-R) framework and technostress literature, the study proposed and tested a model in which robot adoption intensity affects job satisfaction indirectly through increased digital job demands and technostress. The findings indicate that greater integration of robotic technologies in hotel operations is associated with higher levels of digital job demands among employees. The introduction of robotic systems appears to reshape work processes by requiring employees to monitor technological systems, coordinate robot-assisted service activities, and adapt to evolving digital interfaces. These additional digital job demands were found to significantly increase technostress, which in turn negatively affects employees' job satisfaction. The results also demonstrate a significant serial mediation effect, suggesting that the impact of robot adoption on job satisfaction operates through the mechanisms of digital job demands and technostress.

This study contributes to the literature in several ways. First, it extends the application of the Job Demands–Resources framework to the emerging context of human–robot collaboration in hospitality workplaces. While much of the existing research on service robots focuses on customer experiences and service innovation, this study highlights the importance of considering employee outcomes when implementing new technologies. Second, the study integrates insights from technostress research and robotics adoption literature, providing empirical evidence that technological innovations may generate additional psychological demands for employees. Finally, by focusing on the hospitality sector in Serbia, the study contributes to a more geographically diverse understanding of digital transformation in tourism. From a managerial perspective, the findings suggest that hospitality organizations introducing service robots should carefully consider the human resource implications of automation. Providing adequate training, technical support, and clear operational guidelines may help employees adapt more effectively to robotic technologies and mitigate potential technostress. Moreover, managers should ensure that technology implementation strategies prioritize not only operational efficiency but also employee well-being and sustainable workforce management.

Despite its contributions, the study has several limitations that should be taken into consideration for future research. First, the research was conducted using a relatively small sample of hotel employees from Serbia, which may limit the generalizability of the findings. Second, the cross-sectional design does not allow for examining changes in employee perceptions over time as organizations gain more experience with robotic technologies. Future research could employ longitudinal designs or larger cross-country samples to explore how employee responses to robotics evolve during different stages of technological adoption. Additionally, future studies could investigate potential moderating factors, such as digital skills, organizational support, or leadership style, which may influence how employees experience robot-assisted workplaces.

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