Robots at the Table: Unveiling Employee Experiences of Robot Integration in Malaysia's Hospitality Industry

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This study examines how frontline restaurant employees in Malaysia experience and interpret the integration of service robots within a labor-scarce hospitality sector characterized by reliance on a migrant workforce and high-touch service traditions. Drawing on survey data from 142 employees across 22 robot-integrated restaurants, complemented by open-ended survey comments, the study identifies an 'anxiety paradox': while employees appreciate robots as supportive tools that alleviate workload pressures, higher Performance Expectancy of service robots is associated with lower Job Satisfaction, suggesting that perceived capability can heighten concerns about human substitutability and the future value of service labor. Organizational support partially mitigates these tensions, underscoring the importance of workplace conditions in shaping technology-labor relations. By foregrounding employee perspectives, the study contributes to debates in labor process theory and socio-technical systems, demonstrating how automation in Southeast Asian hospitality sectors reshapes employee experiences of job security, satisfaction, and worker identity.

Keywords: Automation; Employee Experience; Employment Relations; Hospitality Labor; Service Robots

INTRODUCTION

The global hospitality sector is undergoing a technological shift marked by increasing deployment of service robots in customer-facing environments (McCartney & McCartney, 2020; Tuomi et al., 2021). These automated or semi-automated systems perform tasks traditionally undertaken by humans, from food delivery to guest interaction, and their adoption is driven by efficiency, cost pressures, service novelty, and persistent labor shortages, trends accelerated by COVID-19 and contactless service imperatives (Gu et al., 2023; Parvez et al., 2022; Van der Meulen et al., 2024). While research has expanded rapidly, it has overwhelmingly prioritized customer acceptance and experience, including engagement and anthropomorphic design, with far less attention to employees who work alongside robots daily (Huo et al., 2025; Hyun et al., 2022; Lu et al., 2020; Lv et al., 2023; Pande & Gupta, 2023; Wang et al., 2025; Xu et al., 2023).

Despite these insights, what remains under-specified is how employees interpret robot integration within Southeast Asian hospitality labor regimes characterized by chronic labor

scarcity and migrant workforce reliance. This study addresses a critical gap in the existing literature by empirically investigating frontline employee experiences of service robot integration within the Malaysian hospitality sector. Specifically, prior research has (i) largely privileged customer perspectives over employee experiences (Lu et al., 2020; Xu et al., 2023), (ii) concentrated on Western and East Asian contexts (Kim et al., 2025; Mejia et al., 2024; Paluch et al., 2022; Shimmura et al., 2020), and (iii) paid limited attention to how employee responses to service robots are shaped by labor regimes, migrant workforce dependence, and employment relations. Malaysia's hospitality sector is characterized by labor scarcity, reliance on migrant workers, and high-touch service traditions, conditions that may shape employee responses to automation differently from those reported in Western and East Asian contexts (Chan & Abdullah, 2021; Ministry of Economy Malaysia, 2021a). Reliance on migrant labor also structures everyday workplace organization, including high staff turnover, segmented job roles, and constrained worker voice (Low, 2021). Service robots are therefore introduced into workplaces already shaped by labor scarcity and migrant workforce reliance.

We propose the Employee Appraisal-Adaptation Model for Robot Integration (EAAMRI) to explain employee adaptation to service robots as a dual appraisal process. Employees evaluate robots instrumentally, as tools that may improve task performance, and existentially, as signals about job security and occupational value. Instrumental appraisals shape expectations about performance improvement, while existential appraisals reflect concerns about labor substitution and occupational displacement. These parallel appraisals influence Employee Attitude towards working with robots and, ultimately, Job Satisfaction.

The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) provides the primary lens for understanding employees' technology-related expectations, Cognitive Appraisal Theory (CAT; Lazarus & Folkman, 1984) explains how technological change is interpreted as opportunity or threat, and the Job Characteristics Model (JCM; Hackman & Oldham, 1976) links these interpretations to employee Job Satisfaction. This layered framework allows the study to connect individual perceptions of service robots with broader workplace outcomes. Guided by this framework, the study addresses the following research questions:

- RQ1: How do frontline restaurant employees in Malaysia make sense of working with service robots in day-to-day service delivery under labor scarcity and migrant workforce reliance?

- RQ2: How do employees' robot appraisals (Perception of Service Robots, Performance Expectancy, and Job Security Concern) shape Employee Attitude towards service robots and, in turn, Job Satisfaction?

- RQ3: To what extent do Facilitating Conditions (training, technical support, and managerial encouragement) moderate the relationship between Performance Expectancy and Job Satisfaction?

By addressing these questions, this study offers empirical insights into the employee experience of automation in hospitality. Conceptually, the proposed EAAMRI model specifies Employee Attitude as a mediating mechanism linking Perception of Service Robots and Job Security Concern to Job Satisfaction, while Facilitating Conditions operate as a moderator that weakens the negative association between Performance Expectancy and Job Satisfaction. The findings bear important implications for technology implementation, workforce management, and

the design of supportive organizational practices, particularly in similar developing economies facing labor challenges.

In sum, this paper makes three main contributions to debates on labor, work, and automation in Southeast Asia. First, it advances empirical understanding of robot integration by positioning Employee Attitude as a key mechanism linking robot-related appraisals to Job Satisfaction, rather than assuming a direct translation from beliefs to work outcomes. Second, it highlights how contextual conditions, in particular Malaysia's labor context, reshape the applicability of global models such as UTAUT, CAT, and JCM, suggesting that universal technology acceptance models may require contextual interpretation. Third, the study identifies an 'anxiety paradox', an empirically observed pattern in which stronger Performance Expectancy of service robots is associated with lower Job Satisfaction. We argue that, in labor-intensive hospitality work, perceived robot capabilities can operate not only as an instrumental benefit signal but also as a capability signal that heightens concerns about human substitutability under conditions of labor scarcity and reliance on migrant workers.

LITERATURE REVIEW

Service Robots in Hospitality: The Predominant Focus

Building on this gap, the hospitality robotics literature remains heavily focused on consumer acceptance and technological design. Numerous studies have examined customer perceptions (Alotaibi et al., 2024; Gu et al., 2023; Hyun et al., 2022), intentions (Cha, 2020; Huo et al., 2025), and acceptance (Kao & Huang, 2023; Santiago et al., 2024; Sung & Jeon, 2020), as well as factors such as trust and perceived risk (Seo & Lee, 2021; Wang & Papastathopoulos, 2024), willingness to pay (Chuah et al., 2022; Chuah & Soeiro, 2025), and the effects of robot design (Huang & Liu, 2022; Jung & Cha, 2022; Liu et al., 2025; Lu et al., 2021; Lv et al., 2023; Qian & Wan, 2024; Seyitoğlu & Ivanov, 2022; Wang et al., 2025). Research has also examined managerial and operational challenges, often using frameworks such as the Technology Acceptance Model (TAM) and UTAUT to analyze drivers of adoption (Odekerken-Schröder & Mennens, 2022; Shimmura et al., 2020; Tuomi et al., 2021). Comprehensive reviews have synthesized developments in this area and mapped future research directions (Mukherjee et al., 2023). However, these studies collectively demonstrate a predominant focus on consumer-facing issues, with employee adaptation and well-being receiving markedly less scholarly attention.

Robot adoption in hospitality is also uneven across organizational scales. Larger hotel chains and corporate restaurant groups typically possess greater financial resources, standardized operating procedures, and technological infrastructure that facilitate the integration of advanced service technologies such as robots. In contrast, small and micro hospitality enterprises often face significant financial and operational constraints that limit their capacity to invest in technology or automation (Anton et al., 2023; Tuomi et al., 2021). These structural differences mean that robot adoption tends to be concentrated in mid- to large-scale establishments or technology-forward outlets located in urban markets, where customer volumes and capital investment capacity justify such innovations (Ivanov & Webster, 2019; Tuomi et al., 2021). Consequently, the organizational scale of hospitality businesses plays an important role in shaping both the feasibility of robot integration and the conditions under which employees encounter these technologies in everyday work. These organizational differences are also associated with distinct labor arrangements. Larger establishments often rely on more formalized staffing systems, specialized roles, and higher customer throughput, whereas smaller and micro enter-

prises frequently depend on family labor, informal employment arrangements, or flexible staffing models (Harney et al., 2022; UNESCAP, 2020). As a result, the implications of robot adoption for employees may vary considerably depending on organizational scale and labor organization.

The Neglected Employee Dimension

Where employee perspectives are addressed, the literature remains both geographically and conceptually constrained. The limited body of employee-centered research, primarily conducted in North American, European, and East Asian contexts, has found that frontline staff often perceive service robots as offering both advantages, such as reduced workload and relief from mundane or physically demanding tasks (Ersoy & Ehtiyar, 2023). At the same time, this research also identifies significant drawbacks, notably anxieties regarding job security, skill obsolescence, role adaptation, and the depersonalization of service (Kim et al., 2025; Lu et al., 2020; Tuomi et al., 2020; Xu et al., 2023). Studies in the United States, for example, highlight job displacement concerns as a major source of stress (Mejia et al., 2024), while research in Japan identifies cultural nuances in employee acceptance and adaptation (Shimmura et al., 2020). Across these regions, the evidence consistently suggests that the successful integration of service robots depends not only on technological implementation but critically on employees' attitudes, engagement, and well-being (Ho & Chuah, 2025; Paluch et al., 2022; Tu et al., 2023).

Nevertheless, there is a marked paucity of research examining these issues in Southeast Asia, particularly in Malaysia, where the distinctive labor context may uniquely shape employee adaptation. The existing literature has yet to account for how such contextual factors influence attitudes toward service robots or modify the applicability of established technology acceptance models.

Building on these insights and the identified gaps in the extant literature, the following section outlines the integrated theoretical framework that underpins this study. This framework draws together UTAUT, CAT, and JCM to inform the proposed EAAMRI.

Theoretical Lenses for Understanding Employee Adaptation in the Malaysian Context

This study adopts an integrated theoretical framework to illuminate the complexities of employee adaptation to service robot implementation within the Malaysian hospitality sector.

UTAUT provides the principal lens for analyzing technology acceptance in organizational settings. While UTAUT2 (Venkatesh et al., 2012) has become widely applied in consumer-focused research, the original UTAUT remains the more relevant framework for workplace contexts such as hospitality. It was developed for organizational adoption scenarios, often where use is strongly encouraged or effectively mandated by management, making it suitable for cases like Malaysian restaurants. At the same time, we acknowledge that some of its voluntary-use assumptions may be less directly applicable in environments where adoption is imposed. Two constructs are of particular relevance. First, Performance Expectancy (PE) refers to the extent to which employees believe that utilizing service robots will improve their individual job performance. This dimension specifically addresses the perceived usefulness of the technology in relation to personal productivity and the efficient completion of work tasks. Second, Facilitating Conditions (FC) pertain to the extent to which employees perceive that the necessary organizational and technical infrastructure, including training, technical support, and managerial encouragement, is available to support their use of the system.

Although the original UTAUT model emphasizes direct effects of Performance Expectancy on behavioral outcomes, earlier technology acceptance research highlights the importance of attitudes as a mediating mechanism linking technology beliefs to work-related responses (Davis, 1989; Venkatesh & Davis, 2000). In the present model, Employee Attitude represents the key psychological process through which cognitive appraisals of robot integration are translated into Job Satisfaction.

This study distinguishes between Performance Expectancy, the extent to which employees believe service robots will improve their individual job performance, and the broader Perception of Service Robots, which reflects a more holistic judgement of robots' suitability and value for the organization as a whole. Performance Expectancy captures perceived personal productivity gains, whereas Perception of Service Robots reflects broader organizational evaluations of robots. In labor-intensive service environments, Performance Expectancy may also act as a capability signal indicating the potential substitutability of human labor. As perceived robot capability increases, employees may simultaneously recognize operational benefits while questioning the long-term security and value of their roles. In such contexts, higher Performance Expectancy may reduce Job Satisfaction by intensifying concerns about labor substitution. Performance Expectancy may therefore carry ambivalent implications for job outcomes in labor-intensive service settings.

The original UTAUT model is adopted in preference to UTAUT2 (Venkatesh et al., 2012), as the latter's additional constructs, such as 'Hedonic Motivation', 'Price Value', and 'Habit', are more pertinent to voluntary, consumer-oriented technology use and are less applicable within the compulsory, employer-driven context examined in this study. Moreover, the construct of Social Influence was not included because robot adoption in these establishments was largely management-driven rather than voluntary, making organizational support more relevant than peer influence in shaping employee responses.

Employee responses to technological change are not determined solely by perceived utility. CAT contends that employees actively evaluate the introduction of new technologies by considering the potential significance for their well-being, including the identification of both threats and opportunities. The deployment of service robots may be appraised as a threat to job security, manifesting as concerns regarding redundancy or reduced working hours (Chen & Cai, 2025; Horpynich et al., 2025), and such perceptions may elevate stress and undermine job satisfaction (Brougham & Haar, 2018; Parvez et al., 2022).

Finally, JCM suggests that changes in task structure, autonomy, and feedback can shape employees' psychological states and Job Satisfaction (Hackman & Oldham, 1976). In this study, JCM is used to contextualize how robot integration may reshape job design, rather than being operationalized as a measured component of the structural model (cf. Bhatti et al., 2024; Do et al., 2023; Yang & Gao, 2023).

Situating the Research: Empirical and Conceptual Gaps in Southeast Asia and Malaysia

Existing employee-focused research shows that working with service robots is often experienced as an ambivalent mix of perceived operational benefits and perceived threats, including job insecurity and deskilling (Ali et al., 2023; Ho & Chuah, 2025; Mejia et al., 2024; Paluch et al., 2022; Tuomi et al., 2020). These dynamics are linked to job attitudes and work outcomes, and Employee Attitude frequently operates as a key psychological mechanism translating technology appraisals into Job Satisfaction (Paluch et al., 2022; Song et al., 2022). However, the evidence base remains concentrated in North America, Europe, and East Asia, leaving Southeast Asia, and Malaysia in particular, under-examined (Abdelhakim et al., 2023; Ho & Chuah, 2025).

This matters because technology appraisals are shaped by labor regimes and organizational framing, meaning that relationships assumed to be generalizable may not travel cleanly into migrant-dependent, labor-scarce hospitality contexts. Consequently, applying findings from other regions is conceptually risky, as employees may interpret robots less through abstract "acceptance" and more through everyday employment relations and operational pressures.

The Employee Appraisal-Adaptation Model for Robot Integration (EAAMRI)

Figure 1 presents EAAMRI, which links Perception of Service Robots, Job Security Concern, Facilitating Conditions, Employee Attitude, and Job Satisfaction.

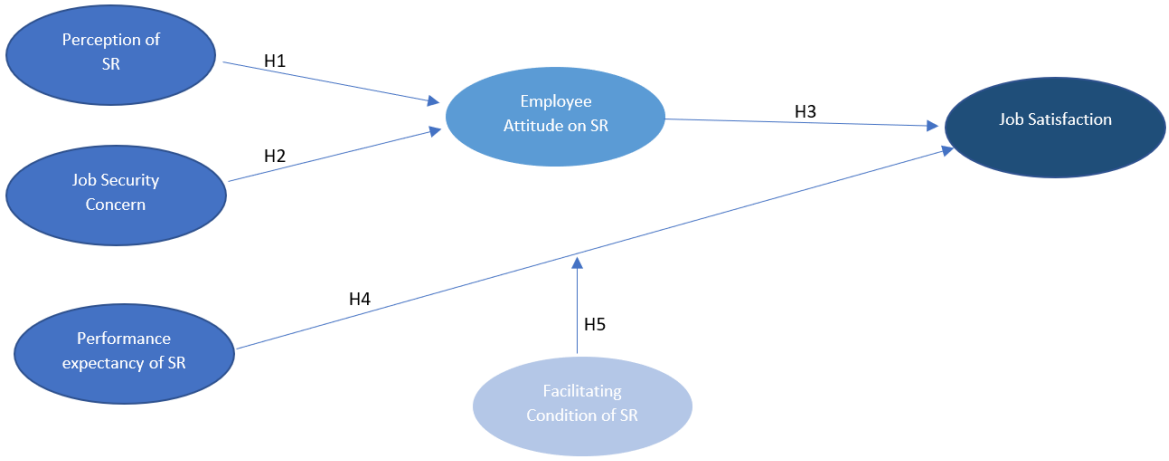

Figure 1. Employee Appraisal-Adaptation Model for Robot Integration (EAAMRI). (Source: Authors' own elaboration)

Hypotheses (EAAMRI)

Drawing on the integrated EAAMRI, the analysis examines how employees' Perception of Service Robots, Job Security Concern, and Performance Expectancy shape Employee Attitude and Job Satisfaction, and how Facilitating Conditions condition the relationship between Performance Expectancy and Job Satisfaction. Prior research suggests that employees who perceive robots as beneficial may report higher Job Satisfaction and develop more favorable attitudes toward working with them (Horpynich et al., 2025; Xu et al., 2023). At the same time, cognitive appraisal perspectives indicate that concerns about job security may shape how employees interpret technological change. In Malaysia's labor-scarce hospitality context, these dynamics may take distinctive forms.

EAAMRI extends existing technology acceptance and cognitive appraisal perspectives by positioning Employee Attitude as the central mechanism of adaptation, linking cognitive evaluations of workplace automation to job-related outcomes. Rather than treating perceptions of technology primarily as drivers of behavioral intention, EAAMRI conceptualizes robot integration as a workplace adaptation process in which employees simultaneously evaluate technological benefits, potential labor displacement risks, and organizational support structures. Within this framework, Perception of Service Robots and Job Security Concern represent distinct forms of cognitive appraisal, while Employee Attitude reflects the adaptive interpretive

response through which these appraisals are translated into workplace satisfaction. Organizational support further conditions this process by shaping whether technological capability is interpreted as a resource that supports employees or as a threat to occupational relevance. Empirically, this conditioning is tested by including an interaction term between Facilitating Conditions and Performance Expectancy when predicting Job Satisfaction.

Employees who perceive service robots as operationally beneficial may be more likely to develop favorable attitudes toward working alongside them, whereas concerns about job security may generate more cautious or negative interpretations of automation (H1 and H2).

- H1 – Perception of Service Robots (PSR) is positively associated with Employee Attitude towards working with service robots (ATT).

- H2 – Job Security Concern (JSC) is negatively associated with Employee Attitude towards working with service robots (ATT).

- Employee Attitude toward workplace technologies may also influence broader evaluations of work conditions. Employees who develop supportive attitudes toward robot integration may be more likely to interpret technological change as beneficial to their daily work experience (H3).

- H3 – Employee Attitude towards working with service robots (ATT) is positively associated with Job Satisfaction (JSAT).

- Expectations regarding robot capability may produce more complex responses. In labor-intensive service settings, higher expectations of robot performance may heighten perceptions of labor substitutability, potentially reducing Job Satisfaction (H4).

- H4 – Performance Expectancy of service robots is negatively associated with Job Satisfaction.

- Organizational support conditions may shape how employees interpret these expectations of technological capability (H5).

- H5 – Facilitating Conditions (FC) moderate the relationship between Performance Expectancy (PE) and Job Satisfaction (JSAT), such that organizational support attenuates the negative relationship between Performance Expectancy and Job Satisfaction.

METHODOLOGY

RESEARCH DESIGN AND CONTEXT

A quantitative, cross-sectional survey design was adopted to examine the relationships among key variables pertaining to the experiences of frontline restaurant employees working with service robots in Malaysia (Creswell & Creswell, 2023; Leavy, 2022). This approach allows for the collection of data from a sample at a single point in time to identify associations between constructs. In addition to the quantitative survey analysis, the questionnaire included a small open-ended item to capture brief employee comments that contextualize the statistical findings. While a quantitative design enables the statistical testing of relationships among key constructs

in the conceptual model, the qualitative responses provide contextual insights into how employees interpret and articulate their experiences of working with service robots. Combining these approaches strengthens the analysis by allowing statistical patterns to be interpreted alongside employees' own reflections, thereby enriching understanding of the social and organizational dynamics surrounding robot integration in Malaysian hospitality workplaces. The study was conducted within restaurants in Kuala Lumpur and Selangor, two highly urbanized areas in Malaysia. These restaurants exemplify early adoption of automation in Malaysia's labor-scarce, service-oriented hospitality industry (Abdelhakim et al., 2023; Channel NewsAsia, 2022; Ho & Chuah, 2025).

Sampling and Data Collection

Participants were recruited from 22 restaurants in Kuala Lumpur and Selangor identified as 'early adopters', defined in this study as establishments that had used service robots in customer-facing roles for a minimum of three months. In this study, the term 'early adopters' is used pragmatically to refer to establishments with operational experience of robot deployment rather than to denote a specific adopter category within diffusion theory. Restaurants were classified as 'early adopters' if service robots had been operational in customer-facing roles for at least three months. This threshold was used to ensure that employee responses reflected post-adoption experiences rather than short-term novelty reactions, consistent with research indicating that technologies require time to become embedded in routine organizational practice (Bhattacherjee, 2001; Cooper & Zmud, 1990).

The participating establishments included mid- to upper-tier casual dining restaurants, family-style chains, and technology-forward independent outlets located in urban commercial districts and shopping malls. These restaurants typically had structured staffing systems, specialized frontline roles, moderate to high daily customer turnover, and sufficient capital investment capacity to procure and maintain service robots. Micro-enterprises and small hawker-style operations were not represented in the sample, as such businesses rarely possess the financial or infrastructural capacity for robot integration. These characteristics reflect the segment of Malaysia's urban restaurant sector where service automation is currently most viable, particularly in establishments facing persistent labor shortages and high reliance on migrant frontline workers.

Purposive and snowball sampling were used, with restaurant managers facilitating access to frontline employees who regularly interacted with service robots. Exclusion criteria applied to both restaurants and staff to ensure adequate exposure to robot integration. Exclusion criteria included restaurants where robots were used only for back-of-house functions and employees with less than one month of direct robot interaction. Variations in restaurant characteristics were not systematically controlled for, consistent with the exploratory aims of the study.

An exact response rate is challenging to calculate precisely due to the nature of purposive and snowball sampling in organizational settings. Initial contact was made with approximately 53 restaurants that appeared to meet the 'early adopter' criteria. Following initial discussions, 22 restaurants granted permission and facilitated access to their employees. Within these restaurants, managers or supervisors helped identify potential participants (frontline employees with direct robot interaction). After obtaining informed consent, questionnaires were distributed. Initial participants were also asked to refer other eligible colleagues within their establishment (snowballing) to maximize reach. This approach ultimately yielded a sample of 142 completed and usable questionnaires. Although exact refusal numbers were not systematically

recorded (given management-mediated access), overall cooperation from participating restaurants was high.

As access to hospitality workplaces often requires organizational approval, participation was mediated through restaurant management. This approach was necessary to obtain access to employees working with service robots but may introduce potential selection bias. Restaurants willing to participate may be those more comfortable with robot integration or with external research, and managers may have facilitated access to employees who were more available or willing to participate. To mitigate this risk, participation was voluntary and anonymous, and employees were approached across multiple establishments with different organizational structures and service formats. While the sampling strategy limits claims of representativeness, it enabled access to frontline employees with direct experience of robot integration, which was essential for the exploratory aims of the study.

Instrument Development

The survey questionnaire consisted of sections covering demographic information and multi-item scales to measure the key constructs of the conceptual model. Scales were adapted from established literature. Performance Expectancy (PE) and Facilitating Conditions (FC) items were adapted from Venkatesh et al. (2003). Job Security Concern (JSC) was adapted from Lazarus and Folkman's (1984) cognitive appraisal framework and prior research on job insecurity and employee responses to automation in workplace settings (Brougham & Haar, 2018; Parvez et al., 2022). Employee Attitude (ATT) items were informed by Ho and Chuah (2025) and Paluch et al. (2022). Job Satisfaction (JSAT) was measured using items adapted from established job satisfaction scales (Spector, 1985), contextualized to the post-robot integration scenario. Open-ended questions were also included to capture qualitative insights. To mitigate potential social desirability bias, anonymity and confidentiality were assured to all participants.

Data Analysis

Data were analyzed using SmartPLS software, suitable for structural equation modelling (SEM) with complex models and when data may not strictly adhere to normality assumptions (Hair et al., 2019). Descriptive statistics (frequencies, means, and standard deviations) were calculated to summarize the demographic characteristics of the sample and the central tendencies of the key variables. Reliability and validity of the measurement model were also assessed. Convergent validity was evaluated using indicator loadings and Average Variance Extracted (AVE), with values above 0.50 considered acceptable. Internal consistency reliability was assessed using Cronbach's alpha and composite reliability. Discriminant validity was assessed using both the Fornell-Larcker criterion and cross-loadings (Fornell & Larcker, 1981). Multicollinearity among predictor variables was checked using variance inflation factor (VIF) values, with values below 4.0 considered acceptable. The structural model was evaluated using path coefficients, R^2 values for endogenous constructs, and Q^2 values for predictive relevance.

PLS-SEM was used to test the hypothesized relationships in the structural model. The sample size (N = 142) exceeds commonly recommended thresholds for PLS-SEM models of comparable complexity, supporting the robustness of the structural analysis (Hair et al., 2019). Whilst the sample comprised diverse demographic characteristics (e.g., age, gender, nationality, role), formal subgroup analyses to test for significant differences in path coefficients across these demographic categories were not performed as part of the primary analysis for this study. This decision was based on maintaining focus on testing the overall proposed conceptual model

and due to considerations of statistical power, as conducting multiple subgroup comparisons with a sample size of N=142 might limit the robustness of detecting significant interaction effects. Investigating such potential demographic moderating effects is a recommended avenue for future research, utilizing larger, more diverse samples specifically powered for such comparisons.

Item	*Characteristics*	*Frequency*	*Percentage*
Age	18-26	46	32.4
	27-35	52	36.6
	36-42	38	26.8
	43-49	4	2.8
	50-59	2	1.4
Gender	Male	88	62.0
	Female	54	38.0
Nationality (Race)	Malaysian (Malay)	17	12.0
	Malaysian (Chinese)	22	15.5
	Malaysian (Indian)	10	7.0
	Malaysian (Other)	14	9.9
	Non- Malaysian	79	55.6
Education	Finished education after high-school	55	38.7
	College/Sixth Form qualifications	63	44.4
	Bachelor's Degree	21	14.8
	Postgraduate Degree	3	2.1
Role	Manager	16	11.3
	Supervisor	18	12.7
	Server	79	55.6
	Frontline Chef	21	14.8
	Bartender	2	1.4
	Cashier	6	4.2
Working Duration	< 1 year	30	21.1
	1-4 years	87	61.3
	4-6 years	18	12.7
	6-9 years	6	4.2
	> 10 years	1	0.7
Working Hours	Full-time	131	92.3
	Part-time	11	7.7
Employment Status	Permanent	116	81.7
	Temporary / Casual	20	14.1
	Internship	6	4.2

Table 1. Demographic characteristics of frontline restaurant employees in robot-integrated establishments (N = 142). Source: Authors' survey data.

Open-ended survey comments were reviewed to identify recurring observations that could contextualize the quantitative findings. These brief responses were grouped into broad, low-inference categories aligned with key constructs in the model, including perceived workload relief, job security concerns, and practical experiences of working alongside robots. Given the survey-based and exploratory nature of these comments, they are presented as illustrative contextual material rather than as a standalone qualitative analysis.

Ethical Considerations

Ethical clearance for this study was obtained from Sunway University Research Ethics Committee (SUREC 2023/047). Participation was entirely voluntary, and informed consent was obtained from all participants before they completed the questionnaire. Anonymity and confidentiality of responses were assured; no personally identifiable information was collected that could link responses back to individual participants.

RESULTS

Demographic Characteristics

Table 1 presents the demographic characteristics of the 142 employees surveyed. The sample was diverse in terms of age, gender, and role, though it was particularly notable that more than half of the respondents were non-Malaysian, reflecting the structural reliance of Malaysia's hospitality industry on migrant labor. This composition is analytically relevant because it reflects the sector's structural reliance on migrant labor and the associated employment relations context in which robot integration is interpreted. The majority of respondents were servers (55.6%), followed by supervisors, chefs, and managers, providing a frontline perspective on the integration of service robots. Most participants were employed full-time (92.3%).

Measurement Model

The measurement model was assessed for reliability and validity, and the results are shown in Tables 2-4. Table 2 reports the reliability and validity statistics for the constructs, Table 3 reports the cross-loadings of the measurement items, and Table 4 presents the heterotrait-monotrait ratio (HTMT) values. The outer loadings (factor loadings) of each item are indicated by the highest loading in each row of Table 3. Overall, the constructs demonstrated acceptable internal consistency and convergent validity. Discriminant validity was supported using the Fornell-Larcker criterion, cross-loadings, and HTMT, with all HTMT values below the recommended threshold of 0.90.

Construct *(Cronbach's Alpha)*	*CR*	*AVE*	*S.D.*	*VIF*	*1*	*2*	*3*	*4*	*5*	*6*
Perception of Service Robots (α=0.899)	0.855	0.719	1.374	3.88	**0.847**					
Job Security Concern (α=0.837)	0.909	0.707	1.802	3.34	0.808	**0.841**				
Performance Expectancy (α=0.899)	0.843	0.791	1.372	3.94	0.685	-0.412	**0.889**			
Employee Attitude (α=0.929)	0.943	0.763	1.319	3.89	-0.137	-0.171	0.754	**0.873**		
Facilitating Conditions (α=0.755)	0.875	0.798	1.229	2.36	0.805	-0.258	-0.566	0.687	**0.893**	
Job Satisfaction (α=0.765)	0.785	0.658	1.356	3.69	0.798	0.336	-0.766	0.741	0.745	**0.811**

Bold values denote the square root of AVE

Table 2. Reliability and validity statistics for the measurement model constructs.

Factor	**Independent Variables/Construct**					
	PS	**JSC**	**PE**	**EA**	**FC**	**JS**
PS1	0.879	0.337	0.205	0.275	0.209	0.190
PS2	0.831	0.376	0.235	0.225	0.152	0.231
PS3	0.699	0.365	0.468	0.228	0.207	0.244
PS4	0.748	0.427	0.221	0.307	0.184	0.342
JSC1	0.384	0.856	0.299	0.398	0.398	0.456
JSC2	0.345	0.806	0.258	0.577	0.376	0.365
JSC3	0.365	0.832	0.243	0.412	0.278	0.433
PE1	0.341	0.236	0.748	0.321	0.310	0.435
PE2	0.233	0.344	0.810	0.211	0.213	0.321
PE3	0.433	0.417	0.778	0.389	0.447	0.434
PE4	0.365	0.309	0.767	0.410	0.394	0.383
EA1	0.245	0.378	0.304	0.816	0.407	0.321
EA2	0.298	0.299	0.312	0.832	0.341	0.281
EA3	0.342	0.421	0.387	0.766	0.252	0.286
EA4	0.404	0.409	0.332	0.699	0.312	0.376
FC1	0.378	0.394	0.410	0.203	0.732	0.311
FC2	0.425	0.383	0.324	0.342	0.772	0.443
FC3	0.404	0.378	0.411	0.431	0.747	0.311
JS1	0.211	0.455	0.398	0.432	0.476	0.857
JS2	0.365	0.365	0.398	0.433	0.377	0.827
JS3	0.365	0.399	0.476	0.410	0.445	0.769
JS4	0.453	0.465	0.405	0.399	0.431	0.737

Table 3. Cross-loadings of measurement items.

	PS	*JSC*	*PE*	*EA*	*FC*	*JS*
PS						
JSC	0.898					
PE	0.876	0.812				
EA	0.883	0.817	0.896			
FC	0.894	0.865	0.899	0.875		
JS	0.889	0.887	0.856	0.845	0.885	

Table 4. Heterotrait-monotrait ratio (HTMT) values.

Structural Model Results

The structural model was estimated to test the relationships proposed in the Employee Appraisal-Adaptation Model for Robot Integration (EAAMRI). The structural model demonstrated moderate explanatory power. As shown in Table 7, the model explained 47.0% of the variance in Employee Attitude ($R^2 = 0.47$) and 61.0% of the variance in Job Satisfaction ($R^2 = 0.61$). Predictive relevance was also established, with Q^2 values of 0.25 for Employee Attitude, indicating moderate predictive relevance, and 0.38 for Job Satisfaction, indicating strong predictive relevance. The results of the hypothesis testing are summarized in Tables 5 and 6. Perception of Service Robots positively predicted Employee Attitude toward working with service robots ($\beta = 0.687$, $p < 0.001$), supporting H1. By contrast, Job Security Concern was negatively but non-significantly related to Employee Attitude ($\beta = -0.058$, $p = 0.077$), and therefore H2 was not supported. Employee Attitude toward working with service robots positively predicted Job Satisfaction ($\beta = 0.784$, $p < 0.001$), supporting H3. Performance Expectancy showed a significant negative relationship with Job Satisfaction ($\beta = -0.564$, $p < 0.05$), supporting H4. Finally, Facilitating Conditions significantly moderated the relationship between Performance Expectancy and Job Satisfaction ($\beta = 0.664$, $p < 0.001$), such that organizational support attenuated the negative association between Performance Expectancy and Job Satisfaction. H5 was therefore supported.

Collectively, the structural model findings support the core propositions of EAAMRI, with the exception of the hypothesized negative effect of Job Security Concern on Employee Attitude.

Hypothesis	***Parameter***	***β***	***t-value***	***p-value***	***f^2***	***Decision***
H1	Perception of Service Robots ----> Employee Attitude	0.687	12.343	0.000	0.47	Supported
H2	Job Security Concern ----> Employee Attitude	-0.058	-1.768	0.077	0.001	Not supported
H3	Employee Attitude ----> Job Satisfaction	0.784	9.265	0.000	0.62	Supported
H4	Performance Expectancy ----> Job satisfaction	-0.564	2.243	0.025	0.29	Supported

**** denoted p-value <0.001 ** denoted p-value of <0.05*

Table 5. Structural model results: estimated path coefficients and significance levels.

Hypothesis	*Parameter*	*β*	*t-value*	*p-value*	*f^2*	*Decision*
H5	Interaction between Facilitating Conditions and Performance Expectancy ----> Job Satisfaction	0.664	10.343	0.000	0.41	Supported

Table 6. Moderating Effect

Construct	*R^2*	*R^2 Interpretation*	*Q^2*	*Q^2 Interpretation*
Employee Attitude (EA)	0.47	Moderate	0.25	Moderate
Job Satisfaction (JS)	0.61	Moderate to High	0.38	Strong

Table 7. Coefficient of Determination (R^2) and Predictive Relevance (Q^2)

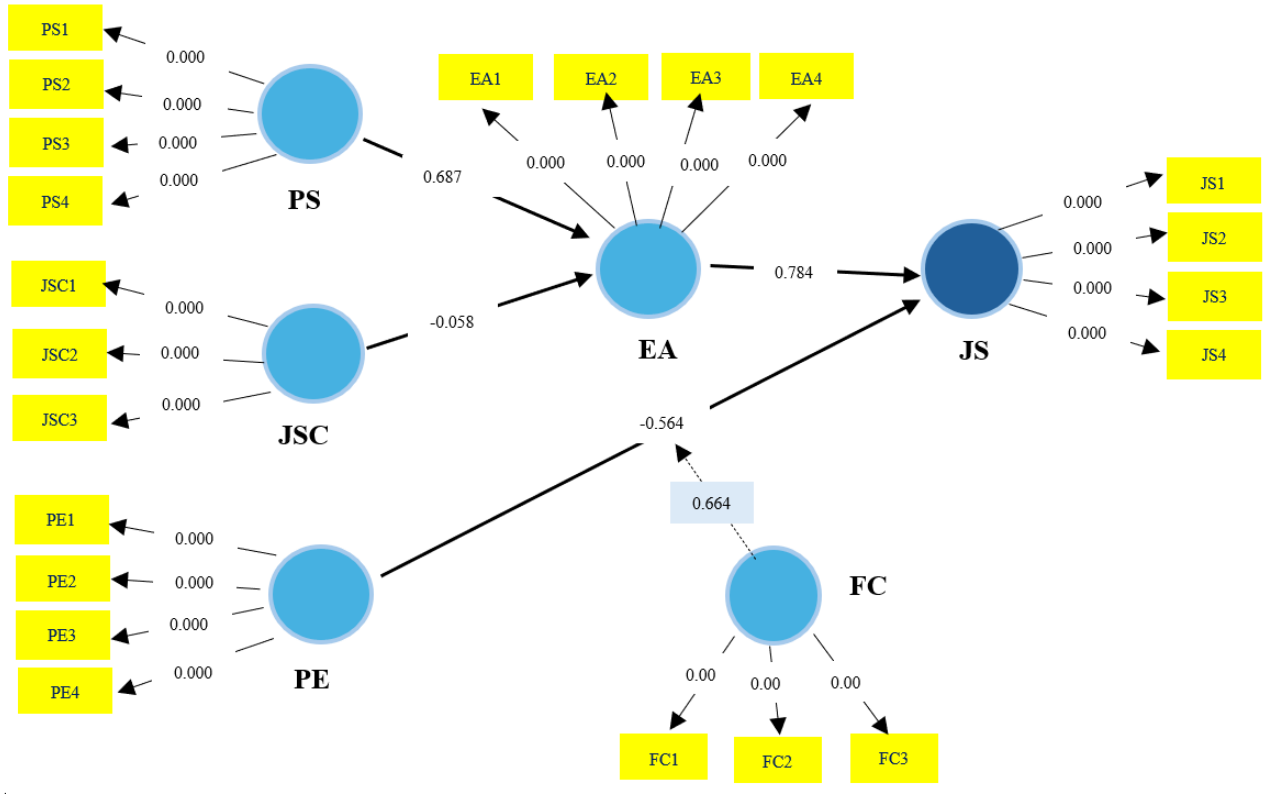

Figure 2. Structural model with moderation effect

To provide context for the statistical patterns, selected open-ended survey comments are used illustratively below to show how employees articulated these experiences in their own words. The analysis revealed several clear patterns in how employees evaluate and respond to service robot integration.

Employees who viewed service robots positively frequently emphasized their usefulness in managing workload during busy periods. As one respondent noted, “The robot service is good; it helps us serve food when we don't have enough staff.” Similar comments described robots as reducing fatigue and assisting service delivery during peak demand.

Alongside these positive appraisals, concerns about job displacement appeared in a more ambiguous way. Whereas international literature typically finds that insecurity undermines Job Satisfaction (Bhatti et al., 2024; Mejia et al., 2024), several Malaysian employees interpreted

robots as unlikely to replace frontline staff: "Robot can't replace service staff"; "I think in the F&B industry, it would be a long way for human job to be replaced by robot as there are some disadvantages of using robot fully in a restaurant setting"; and "Job still same, robot help do service when needed." These responses suggest that anxieties about technological change were sometimes reframed into pragmatic reassurance that robots could help sustain operations in chronically understaffed workplaces.

Employee attitudes also shaped how workers interpreted their experiences with robots. Employees who viewed robots positively tended to express supportive orientations toward working with them, which corresponded with higher job satisfaction. Some highlighted the ease of collaborating with robots: "Easy to deal rather than working with lazy and stubborn staffs." Others emphasized the inevitability of digitalization: "This is digitalized world. It doesn't take long to learn how to use or work alongside service robots." Still others pointed to practical benefits: "[Robots] ease our job by a lot."

Yet not all experiences were reassuring. Several respondents linked perceptions of increasing robot capability to unease about future staffing decisions: "May be boss will prefer to use robot in future"; "The more the robots can do, the less we feel needed". These comments are used illustratively to contextualize the negative association between Performance Expectancy and Job Satisfaction reported in the structural model.

Organizational support, finally, was consistently described as decisive. Employees who experienced strong Facilitating Conditions, including training, troubleshooting assistance, and managerial encouragement, reported higher satisfaction and were less unsettled by the presence of capable robots. They also noted practical limitations, such as robots' inability to serve certain dishes ("robot cannot soup noodle") or issues with customer misuse ("from my observation customer takes the food served on the robot even though it's not their food"). These accounts underscore JCM's insight (Hackman & Oldham, 1976) that workplace support and job design shape how new technologies affect employee well-being: without protocols to preserve the human touch, robots risk eroding service quality, but with appropriate support, they can enrich job roles.

These reflections highlight the nuanced ways Malaysian hospitality employees make sense of automation. Positive perceptions and supportive conditions foster satisfaction, while anxieties about redundancy remain salient whenever robots are seen as increasingly competent. The following discussion situates these results within broader debates about technology, labor, and employment relations, highlighting their implications for both theory and practice in Southeast Asia.

DISCUSSION: TECHNOLOGY, LABOR, AND CONTEXT

The findings indicate that employee adaptation to service robots cannot be explained through technology acceptance models alone. Instead, employees interpret robot integration through the broader socio-economic conditions of hospitality work. The discussion therefore develops three contributions: the empirical dynamics of employee adaptation, the contextual limits of universal technology acceptance models, and the theoretical implications of employee responses to automation in labor-scarce hospitality contexts.

Consistent with evidence from Western contexts (Mejia et al., 2024; Paluch et al., 2022) and East Asian settings (Kim et al., 2025; Shimmura et al., 2020), Malaysian employees exhibited a dual orientation toward service robots, valuing their operational assistance in addressing labor shortages and repetitive tasks while simultaneously expressing unease about the longer-term implications of automation for job security and occupational identity.

However, the structural model results complicate a central assumption of technology acceptance research. Conventional technology acceptance frameworks typically assume that stronger Performance Expectancy leads to more positive workplace outcomes, as employees who perceive technology as useful are expected to respond with greater satisfaction and acceptance (Venkatesh et al., 2003; 2012). In contrast, the present study finds that higher Performance Expectancy is associated with lower Job Satisfaction.

Within the EAAMRI model, this pattern reflects the coexistence of operational benefits and perceived labor substitutability. The positive interaction indicates that organizational support weakens the negative relationship between Performance Expectancy and Job Satisfaction. Where training and managerial support were stronger, expectations of robot capability were less likely to reduce satisfaction. Conversely, weak Facilitating Conditions may intensify uncertainty regarding technological change and amplify concerns about labor substitution. Within the EAAMRI model, Facilitating Conditions therefore shape how employees interpret technological capability, influencing whether robot integration is perceived as organizational support for human work or as a signal of occupational vulnerability.

Such concerns are increasingly recognized in research on automation and labor displacement, suggesting that improvements in technological capabilities may intensify employees' perceptions of occupational vulnerability rather than simply enhancing technology acceptance (Frey & Osborne, 2017; Lu et al., 2020; Wirtz et al., 2018; Xu et al., 2023). In labor-intensive service industries where interpersonal interaction forms a core component of work identity, the perceived competence of service robots may therefore generate both operational optimism and existential concern.

EMPLOYEE ADAPTATION TO SERVICE ROBOTS IN PRACTICE

We refer to this pattern as the 'anxiety paradox', which should be distinguished from several related strands of research. Studies on employee ambivalence toward automation highlight the coexistence of positive and negative attitudes toward technological change (Lu et al., 2020; Xu et al., 2023). Other work has examined robot-induced stress or technostress arising from human-robot collaboration (Ersoy & Ehtiyar, 2023), as well as job insecurity linked to automation and artificial intelligence (Brougham & Haar, 2018; Parvez et al., 2022). While these studies document anxiety or mixed attitudes, they typically assume that perceived technological usefulness increases acceptance and satisfaction.

A particularly important finding of the present study is that Job Security Concern did not significantly predict Employee Attitude toward working with service robots. This suggests that employees' attitudinal responses were not directly organized through explicit insecurity claims. In the Malaysian context, where chronic labor shortages make robots pragmatically useful for sustaining service delivery, workers may accept robot integration at the level of day-to-day attitudes even while remaining uneasy about what increasing robot capability implies for the longer-term value of human labor. Put differently, the threat dynamic does not disappear but is displaced. Rather than appearing as a straightforward negative effect of Job Security Concern on Employee Attitude, it re-emerges through the negative relationship between Performance Expectancy and Job Satisfaction. In this sense, perceived technological capability may operate simultaneously as a signal of operational support and a signal of potential labor substitutability.

Comparable interpretive dynamics have been observed elsewhere in Southeast Asia. Cornell et al. (2024) show that ghost kitchen employees in the Philippines, despite working in pre-

carious, platform-driven contexts, often expressed loyalty and satisfaction, reframing insecurity as opportunity. Both cases illustrate how Southeast Asian hospitality workers actively reinterpret technological and organizational disruptions in ways that challenge universalist models of labor precarity.

Contextual Limits of Universal Technology Acceptance Models

Malaysia's migrant-dependent hospitality labor regime is central to interpreting these findings. Under conditions of constrained worker voice and unequal bargaining power, perceived robot capability can be read not only as operational efficiency but also as a signal of replaceability. Although this study did not test migrant versus domestic differences, the sector's structural reliance on migrant labor provides a plausible institutional backdrop for why performance beliefs could depress job satisfaction.

The qualitative comments help clarify this pattern. Several respondents insisted that "robots cannot replace humans", which should not be read as the absence of concern. Rather, these statements suggest pragmatic reassurance: employees recognize robots' operational usefulness while continuing to defend the distinct value of human service labor. This tension between perceived robot capability and asserted human indispensability helps explain why explicit Job Security Concern did not directly shape attitudes even though higher Performance Expectancy still depressed Job Satisfaction.

The Anxiety Paradox and Implications for Labor Process Theory

The EAAMRI model advances technology acceptance research by demonstrating that employee responses to automation are shaped not only by perceptions of usefulness but also by labor-related threat appraisals and organizational framing processes. This study advances labor process and employment relations research in three ways.

First, it foregrounds Employee Attitude as a central mediator in the adaptation process. While technology acceptance models such as TAM and UTAUT often assume relatively direct pathways from Performance Expectancy to outcomes (Venkatesh et al., 2003), our findings confirm arguments in service management (Ho & Chuah, 2025; Paluch et al., 2022) that attitudes remain essential for explaining how employees internalize technological change.

Second, it demonstrates how contextual conditions reshape the applicability of global models. In contrast to evidence from the United States and Europe, where insecurity erodes satisfaction (Brougham & Haar, 2018; Mejia et al., 2024), Malaysian employees framed robots as workload support rather than threats. This divergence shows that employee reactions are not universal but contingent, demanding that technology acceptance models be re-grounded in national labor markets and policy regimes.

As a whole, the findings demonstrate that employee responses to service robots reflect a broader process of workplace adaptation rather than simple technology acceptance. By integrating cognitive appraisal, technology perception, and organizational support, the EAAMRI model explains how employees interpret automation within the socio-economic realities of service work. In labor-scarce hospitality contexts such as Malaysia, robots may simultaneously alleviate operational pressures while symbolizing potential labor displacement. Understanding this duality is therefore essential for both theory and practice, as the success of service robot integration depends not only on technological performance but also on how employees interpret its implications for their role within the organization.

Implications for Labor Relations, Policy, and Practice

These findings carry implications for labor relations, policy, and managerial practice.

For managers, the evidence that employees valued robots as workload support but feared redundancy highlights the need to frame robots as collaborative partners ("cobots") rather than replacements. This aligns with calls in hospitality literature to emphasize augmentation and human–robot complementarity (Do et al., 2023; Yang & Gao, 2023).

Organizational support emerged as especially important. Employees' reflections on technical shortcomings (e.g., robots unable to serve noodles or requiring human oversight) show that training and facilitation must extend beyond technical fixes to include protocols for preserving human touch in service delivery, a theme emphasized in East Asian studies on culturally ingrained service norms (Shimmura et al., 2020).

At the policy level, Malaysia's reliance on migrant labor and its state-led Fourth Industrial Revolution (4IR) agenda (Ministry of Economy Malaysia, 2021a, 2021b) suggests that robot adoption cannot be treated as a simple technological solution to labor shortages. Rather, automation in hospitality emerges at the intersection of labor market pressures and broader state strategies promoting digital transformation.

These findings demonstrate that robot adoption succeeds or fails not on technological capability alone but on the interaction of labor markets, cultural service expectations, and organizational support structures. Equally important, employees are not passive recipients of automation but active interpreters of its meaning, underscoring the need to foreground employee voice in both managerial and policy decisions.

Limitations and Future Research in Southeast Asian Contexts

First, the focus on 22 restaurants in Kuala Lumpur and Selangor provides valuable insights into Malaysia's most advanced sites of robot adoption, but may not reflect experiences in smaller towns, rural areas, or other hospitality segments. Comparative studies across different regions, and across Southeast Asian countries more broadly, would help clarify how national labor regimes and cultural norms condition employee adaptation to robots. Given the purposive sampling of early adopters and the organizationally mediated access to participants, findings should be interpreted as exploratory and hypothesis-generating rather than statistically representative of the broader hospitality workforce.

Second, the survey design, while offering breadth, limited the depth of qualitative insights. Ethnographic or longitudinal approaches could capture how anxieties and attitudes evolve over time as robots become more capable and embedded in everyday service routines. This would extend beyond snapshots of perception to the dynamics of adaptation.

Third, although a small number of respondents held managerial roles, the analysis focused primarily on frontline service employees who interact directly with robots. Since robot adoption is shaped by managerial directives, consumer preferences, and national policy agendas, future research should adopt multi-perspective designs to situate employee experience within these wider socio-technical systems.

An additional point concerns the complex role of job security perceptions in shaping Employee Attitude toward robot integration. While the discussion interprets this pattern in relation to Malaysia's labor-scarce hospitality context, alternative explanations cannot be ruled out. For example, statistical suppression effects may arise in models that include multiple related attitudinal constructs, potentially altering the apparent direction of relationships. Similarly, perceptions captured by job security may reflect complex interpretations of workplace stability

rather than simple anxiety about displacement. It is also possible that organizational access mediated by restaurant management influenced the composition of the sample or the willingness of employees to express critical views. These considerations do not invalidate the pattern, but they do require further investigation.

Finally, while the conceptual model draws insights from technology acceptance research alongside CAT and JCM, it necessarily simplifies the broader complexities of labor process change. Standardized scales risk abstracting away from the lived realities of labor and precarity in hospitality work. Future studies could enrich this approach by explicitly combining labor process theory with technology acceptance models in mixed-method designs, thereby linking statistical patterns to the everyday meanings employees attach to automation.

In sum, this study highlights the importance of situating service robot adoption within specific labor contexts. To advance understanding, future research should explore how the *anxiety paradox* and related dynamics vary across economies with different labor market conditions, union structures, and service traditions.

CONCLUSION

This study provides an early empirical examination of how hospitality employees in Malaysia interpret and adapt to the introduction of service robots. The findings show that automation in hospitality cannot be understood simply as a technological innovation but must be analyzed as a labor process shaped by institutional context, labor market pressures, and organizational practices.

The study advances existing research in two principal ways. First, it introduces the concept of the anxiety paradox, demonstrating that higher Performance Expectancy of service robots may coexist with declining Job Satisfaction when technological competence signals potential labor substitutability. Notably, this tension did not appear through a direct effect of Job Security Concern on Employee Attitude, suggesting that automation-related unease may be mediated less by explicit insecurity claims than by how workers interpret robot capability in context. Second, it shows that this relationship is shaped by the structural conditions of Malaysia's labor-scarce hospitality sector, where reliance on migrant labor and chronic staffing pressures influence how employees interpret technological change. Together, these findings demonstrate that technology acceptance accounts remain analytically incomplete unless they are re-embedded within the political economy of hospitality labor and the employment relations through which automation is experienced.

Practically, the results suggest that successful robot integration depends less on technological capability alone than on organizational support and communication that frame robots as complements rather than replacements for human labor. Training, operational protocols, and managerial messaging play a central role in shaping whether employees interpret automation as assistance or as a signal of occupational displacement.

Future research should examine whether the anxiety paradox emerges in other hospitality labor regimes and service cultures. Comparative and longitudinal studies will be particularly valuable for understanding how employee attitudes evolve as robots become more deeply embedded in service work and as automation technologies continue to advance.

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DISCLOSURE

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