ROBOTS AT THE TABLE: INTERACTION QUALITY AND TECHNOLOGY ACCEPTANCE SHAPE CUSTOMER REVISIT IN RESTAURANT

ALIAS, M. A.[1,2] – ABDULLAH, D.[3,4,5,6*] – MAHADEWI, N. M. E.[7] – KALSUM, E. U.[8] – HAMZAH, H.[5] – DUARI, I. P. H. N.[9]

[1] *Primula Beach Hotel Sdn. Bhd., Terengganu, Malaysia.*

[2] *Faculty of Hotel and Tourism Management, Universiti Teknologi MARA (UiTM) Terengganu Branch, Terengganu, Malaysia.*

[3] *Faculty of Hotel and Tourism Management, Universiti Teknologi MARA (UiTM) Penang Branch, Penang, Malaysia.*

[4] *Business Technology Section, Universiti Kuala Lumpur Malaysian Spanish Institute, Kedah, Malaysia.*

[5] *Faculty of Hospitality and Tourism Management, UCSI University, Kuala Lumpur, Malaysia.*

[6] *Open University Malaysia, Penang, Malaysia.*

[7] *Tourism Department, Politeknik Pariwisata Bali, Bali, Indonesia.*

[8] *Hospitality Management, Politeknik Pariwisata NHI Bandung, West Java, Indonesia.*

[9] *Usaha Perjalanan Wisata, Sekolah Tinggi Pariwisata AMPTA, Yogyakarta, Indonesia.*

**Corresponding author*
e-mail: dahla707[at]uitm.edu.my

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Abstract. Restaurant service robots are increasingly deployed in food service establishments to perform table service, deliver food, and handle routine customer interactions, yet their ability to generate repeat patronage remains uncertain. This study examines how interaction quality and core technology acceptance factors, namely, perceived ease of use and perceived usefulness, directly influence customer intentions to revisit robot-assisted restaurants. Data were collected between October 2024 and January 2025 across 18 participating full-service and casual dining restaurants in Malaysia. A purposive online survey produced 251 usable responses from verified adult patrons who had experienced restaurant service robots during the preceding six months. Data were analysed using partial least squares structural equation modeling (PLS-SEM via SmartPLS 4). The structural results reveal that perceived usefulness ($\beta = 0.248$, $p < 0.001$) and perceived ease of use ($\beta = 0.150$, $p < 0.05$) directly drive customer revisit intention, explaining 11.5% of the total variance ($R2 = 0.115$). Conversely, interaction quality exerts no significant direct effect on revisit intention ($\beta = 0.003$, $p > 0.05$). These findings demonstrate that a pleasant robot encounter does not, by itself, secure customer return unless translated into tangible utility and effortlessness. Restaurant operators should prioritize seamless functional execution, clear interface usability, and visible operational benefits such as reduced waiting times.

Keywords: *interaction quality, perceived ease of use, perceived usefulness, revisit intention, restaurant service robots*

Introduction

Hospitality and tourism operators are rapidly integrating frontline service technologies to manage labour shortages and improve operational efficiency. In dining establishments, restaurant service robots greet guests, provide menu information, deliver food and beverages, and clear tables. While automation offers operational consistency, commercial success relies on whether these technologies foster customer retention and repeat patronage. Understanding customer evaluations of restaurant service robot encounters has therefore become a critical priority for hospitality managers and scholars alike (Kim et al., 2022; Huang et al., 2021; Gursoy et al., 2019). Prior research in hospitality robotics has largely progressed along two separate tracks: (1) cognitive technology acceptance frameworks focusing on utility, ease, trust, and risk (Huang et al., 2024; Kao and Huang, 2023; Seo and Lee, 2021); (2) service interaction studies examining relational cues such as anthropomorphism, social presence, and interaction quality (Yang et al., 2024; Kim et al., 2022; Huang et al., 2021). Although both perspectives offer valuable insights, their relative direct influence on post-consumption behavioural outcomes, specifically revisit intention, remains under-examined within a single integrated framework. A key theoretical question is whether service interaction quality directly motivates repeat patronage or whether post-experience retention is driven primarily by cognitive beliefs regarding system usefulness and operational simplicity.

Furthermore, empirical evidence remains geographically concentrated in Western and East Asian economies, frequently relying on hypothetical scenarios or general adoption intentions rather than verified post-experience customer feedback (Santiago et al., 2024; Molinillo et al., 2023; Seo and Lee, 2021). Examining this relationship within the Malaysian restaurant context provides a meaningful theoretical contribution beyond contextual replication. As an emerging Southeast Asian economy characterized by a multi-ethnic society and deeply ingrained high-touch hospitality traditions, Malaysia represents an intriguing setting where traditional warmth collides with automated frontline technologies. Evaluating actual customer experiences in this environment clarifies whether high-touch service expectations can be replaced or complemented by automated interaction quality, or if customer loyalty in emerging markets is fundamentally dictated by practical technological utility. This study addresses these gaps by testing a conceptual model where interaction quality, perceived ease of use, and perceived usefulness directly predict customer revisit intentions toward robot-assisted restaurants. Using empirical data from 251 verified restaurant patrons in Malaysia across 18 dining establishments, this study provides actionable insights for hospitality technology management.

Literature review

Restaurant service robot

Restaurant service robots are autonomous or semi-autonomous machines designed to execute customer-facing service tasks. Their operational benefits include task reliability, reduced waiting times, and labour support (Belanche et al., 2021; Wirtz et al., 2018). Customer evaluations of restaurant service robots depend on both functional cues (speed, accuracy, usability) and interactive cues (courtesy, responsiveness, clarity) (Rana et al., 2025; Huang et al., 2021). As restaurants transition from initial novelty toward mainstream adoption, customer retention depends on whether robot-assisted

service delivers genuine value throughout the dining experience (Santiago et al., 2024; Chen and Girish, 2023).

Underpinning framework

The Technology Acceptance Model (TAM) posits that perceived ease of use (PEOU) and perceived usefulness (PU) are key determinants of technology evaluations (Davis, 1989). In restaurant settings, PEOU reflects the degree to which operating or receiving service from a restaurant service robot is uncomplicated and effort-free, whereas PU measures whether the technology enhances service speed, quality, and overall dining efficiency. In addition to technological beliefs, frontline service encounters depend on interaction quality (IQ), the overall excellence, courtesy, and responsiveness demonstrated during customer-robot exchanges (Song et al., 2022; Choi and Kim, 2013).

Hypotheses development

Interaction quality and revisit intention

Interaction quality refers to customers' evaluation of the smoothness, courtesy, and responsiveness of service interactions (Choi and Kim, 2013). In limited-service restaurant settings, high-quality interactions with service robots can enhance customers' perceived usefulness, perceived ease of use, attitudes toward the technology, and overall technology acceptance (Kao and Huang, 2023). Furthermore, research in hospitality service environments suggests that positive human-robot interactions promote customers' acceptance of service robots and contribute to favorable service experiences, which may subsequently increase their intention to revisit the establishment (Song et al., 2022). Based on these findings, the following hypothesis is proposed:

H1: Interaction quality positively influences revisit intention.

Perceived ease of use and revisit intention

Perceived ease of use reflects the extent to which interacting with a technology is perceived to be free of physical and mental effort (Davis, 1989). When restaurant service robots feature intuitive interfaces, straightforward table-service procedures, and simple error-recovery mechanisms, customers experience lower cognitive friction and heightened convenience (Ashfaq et al., 2025). Effortless interactions foster positive overall post-consumption attitudes, directly motivating repeat patronage (Figueiredo et al., 2026; Kao and Huang, 2023). Grounded in these theoretical arguments and empirical observations, the following hypothesis is advanced:

H2: Perceived ease of use positively influences revisit intention.

Perceived usefulness and revisit intention

Perceived usefulness refers to the customer's perception that the technology enhances efficiency and service quality (Davis, 1989). When restaurant service robots effectively shorten waiting times, deliver meals accurately, and improve service consistency, patrons perceive clear practical benefits (Guan et al., 2022; Seo and Lee, 2021). This functional utility strengthens the restaurant's value proposition, providing a

strong reason for customers to return (Figueiredo et al., 2026). Grounded in this theoretical logic and empirical support, the following hypothesis is formulated:

H3: Perceived usefulness positively influences revisit intention.

Materials and Methods

Sampling and data collection procedure

The target population consisted of adult restaurant customers (aged 18 years and above) in Malaysia who had dined at a restaurant using service robots within the previous six months. Data were collected between October 2024 and January 2025 from customers at 18 participating casual and full-service restaurants located in major urban areas of the Klang Valley and Penang. A non-probability purposive sampling technique was employed to recruit eligible respondents. The survey was administered through Google Forms, with QR codes linking directly to the questionnaire placed on dining tables or distributed by restaurant staff with the approval of restaurant management. To ensure respondent eligibility and data quality, two mandatory screening questions were included at the beginning of the survey: (1) “Are you 18 years of age or older?” and (2) “Have you visited a restaurant in Malaysia that uses service robots within the past six months?” Only respondents who answered “Yes” to both questions were allowed to proceed with the survey. A total of 251 completed questionnaires met the screening criteria and were deemed usable for subsequent empirical analysis.

Measurement instrument

All study constructs were assessed using a seven-point Likert scale, with response options ranging from 1 (strongly disagree) to 7 (strongly agree). The measurement indicators were adopted and modified from established scales reported in prior studies. Interaction Quality (IQ) was evaluated through three items adapted from Choi and Kim (2013), while Perceived Ease of Use (PEOU) was measured using four items derived from Davis (1989). Perceived Usefulness (PU) was captured through three items adapted from Song et al. (2022), and Revisit Intention (RI) was assessed using four items based on the scale developed by Um et al. (2006). To ensure content validity, the survey instrument underwent evaluation by two academics with expertise in hospitality management. Before the primary survey administration, a pilot test involving 30 participants was carried out to examine the reliability of the measurement items. The findings showed that all constructs produced Cronbach’s alpha values exceeding the recommended benchmark of 0.70, indicating acceptable internal consistency and providing initial support for the reliability of the research instrument.

Common method bias (CMB)

Common method bias was evaluated using the random dependent variable (RDV) full collinearity approach in PLS-SEM (Kock, 2015; Kock and Lynn, 2012). Factor-level Variance Inflation Factor (VIF) values ranged from 1.014 to 1.205 (IQ = 1.014, PEOU = 1.185, PU = 1.205, RI = 1.130). Because all VIF values were well below the conservative threshold of 3.3, common method bias was not a threat to dataset validity.

Results and Discussion

Respondents profile

A total of 251 valid responses were collected for analysis. The sample comprised 59.0% female respondents and 41.0% male respondents. Most participants were between 25 and 34 years old (37.5%), followed by those aged 18 to 24 years (31.5%), indicating a relatively young respondent profile. The majority of respondents were Malay (74.9%), followed by Chinese (22.3%) and Indian (2.8%). In terms of educational attainment, nearly half of the respondents held a bachelor's degree or equivalent qualification (48.6%), while 37.5% possessed a diploma or equivalent. Regarding employment status, most respondents were employed full-time (56.2%), followed by students (17.1%). Monthly income levels were relatively diverse, with the largest proportion earning between RM3,000 and RM4,999 (29.1%), followed by RM1,000 to RM2,999 (24.7%). Overall, the sample primarily consisted of young, educated, and economically active consumers who had experience dining in restaurants utilizing service robots.

Measurement model assessment

SmartPLS 4 was used to evaluate the model (Ringle et al., 2024). As shown in *Table 1*, composite reliability (ρc) values ranged from 0.790 to 0.816, exceeding the 0.70 threshold (Hair et al., 2019). Average Variance Extracted (AVE) values ranged between 0.507 and 0.592, confirming convergent validity (> 0.50) (Hair et al., 2021; Fornell and Larcker, 1981). Item outer loadings ranged from 0.596 to 0.823; items with loadings slightly below 0.708 were retained because construct AVE and composite reliability benchmarks were fully met. Discriminant validity was established via the Heterotrait-Monotrait ratio (HTMT) (Henseler et al., 2015). As shown in *Table 2*, all pairwise HTMT ratios (0.207 to 0.614) were well below the stringent 0.85 threshold.

Table 1. *Reliability and convergent validity.*

Code	Items	L	CR	AVE
Interaction Quality			0.812	0.592
IQ1	I believe that the quality of my interaction with the service robot was excellent.	0.781		
IQ2	I believe that the service robot showed genuine care and interest during my interactions.	0.823		
IQ3	I believe that service robots offer courteous and friendly service to customers.	0.698		
Perceived Ease of Use			0.803	0.507
PEOU1	I find that resolving errors when using the services provided by the robot at the restaurant is easy.	0.596		
PEOU3	Overall, I find the restaurant service robot easy to use.	0.748		
PEOU4	I find that using the restaurant service robot was easy and uncomplicated.	0.757		
PEOU5	I find that my interaction with the restaurant service robot is easy to understand.	0.736		
Perceived Usefulness			0.790	0.558
PU2	The use of service robots in restaurants can enhance service efficiency for me.	0.690		
PU3	The use of service robots in restaurants will allow me to experience higher-quality service.	0.819		
PU4	The use of service robots in restaurants can help reduce waiting time for food and drinks.	0.727		
Revisit Intentions			0.816	0.525
RI1	I enjoy visiting restaurants that use service robots for their operations.	0.723		
RI2	I prefer restaurants with service robots and plan to visit them again in the future.	0.693		
RI3	I am likely to return to restaurants that incorporate service robots into their services.	0.749		
RI4	I will recommend to my friends and relatives that they visit restaurants that use robot-assisted services.	0.733		

Note: PEOU2 and PU1 were removed due to low loadings; L=Loadings.

Table 2. *Discriminant validity (HTMT ratio).*

Constructs	IQ	PEOU	PU
Interaction Quality (IQ)	-		
Perceived Ease of Use (PEOU)	0.465	-	
Perceived Usefulness (PU)	0.382	0.614	-
Revisit Intentions (RI)	0.207	0.366	0.462

Structural model assessment

Structural paths were evaluated using 10,000 bootstrap resamples (one-tailed, $\alpha = 0.05$). As shown in *Table 3* and *Figure 1*, two of the three hypotheses were supported. Perceived usefulness was the strongest direct predictor of revisit intention ($\beta = 0.248$, $t = 3.661$, $p < 0.001$), supporting H3. Perceived ease of use also significantly increased revisit intention ($\beta = 0.150$, $t = 1.861$, $p < 0.05$), supporting H2. However, the direct path from interaction quality to revisit intention was non-significant ($\beta = 0.003$, $t = 0.030$, $p > 0.05$), rejecting H1. Together, the three predictors explained 11.5% of the variance in customer revisit intentions ($R2 = 0.115$).

***Table 3**. Hypothesis testing results (direct effects).*

Hypotheses	Path	β	Std. Error	t-value	p-value	Decision
H1	IQ → RI	0.003	0.096	0.030	0.488	Not Supported
H2	PEOU → RI	0.150	0.080	1.861	0.031	Supported
H3	PU → RI	0.248	0.068	3.661	0.000	Supported

Note: IQ=Interaction Quality; PEOU=Perceived Ease of Use; PU=Perceived Usefulness; RI=Revisit Intentions.

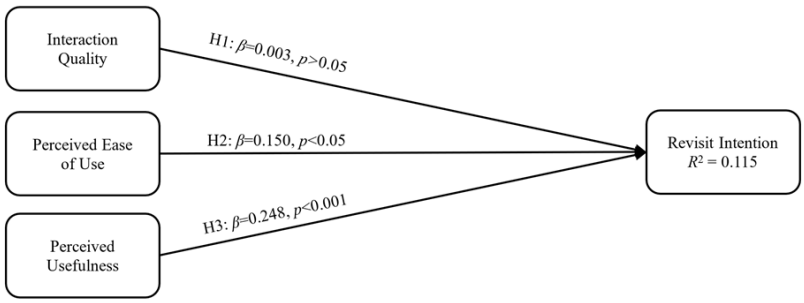


***Figure 1.** Structural model results.*

Theoretical implications

These empirical findings provide important insights into how technology acceptance and service encounter factors influence customer retention in automated dining environments. First, the findings highlight the dominance of functional utility over interactive appeal. The non-significant direct effect of interaction quality on revisit intention ($\beta = 0.003$) suggests that positive social interactions with service robots do not, by themselves, encourage customers to return. Although customers may perceive a robot's automated friendliness as novel or enjoyable, repeat patronage is driven primarily by practical and performance-related outcomes. This indicates that customers place greater value on efficiency, reliability, and service effectiveness than on the robot's social capabilities. Second, the results validate the Technology Acceptance Model (TAM) in post-experience hospitality contexts. Both perceived usefulness ($\beta = 0.248$) and perceived ease of use ($\beta = 0.150$) were found to have significant direct effects on revisit intention. These findings demonstrate that the core constructs of technology acceptance remain relevant beyond the initial adoption stage, continuing to shape customers' behavioural intentions after actual service experiences. Consequently,

technologies that are useful and easy to use can play a critical role in fostering customer retention in physical service settings. Third, the findings offer contextual insights into customer perceptions of service robots in emerging Asian markets. In high-contact hospitality environments such as Malaysia, customers appear to prioritize operational benefits, including service speed, delivery reliability, and convenience, over simulated social interactions. As a result, service robots are viewed primarily as functional service tools rather than social companions. This suggests that customers assess robotic services largely based on their ability to enhance service performance and operational efficiency.

Practical implications

The findings of this study have several implications for practitioners. First, restaurant operators should prioritize operational efficiency when implementing service robots. Robots should be deployed primarily for tasks where their utility is most evident, such as reducing order delivery times, transporting heavy trays, and clearing tables. In this context, speed and service accuracy should take precedence over scripted friendliness. Second, restaurants should design intuitive customer touchpoints to ensure a seamless user experience. Interface navigation should be effortless, with concise and multilingual screen prompts, as well as clear error-recovery options, to minimize friction during ordering and food retrieval. Third, practitioners should adopt a strategic hybrid service model. Frontline employees should continue to manage high-contact hospitality functions, such as greeting customers, handling complaints, and providing recommendations, while service robots focus on repetitive and operational tasks, particularly food and item transportation.

Limitations and future research

This study has limitations that present opportunities for future research. First, data were collected using a cross-sectional survey in Malaysia, limiting long-term causal inferences. Second, the model accounts for 11.5% of revisit intention variance, reflecting that repeat dining decisions are heavily shaped by broader holistic factors. Future research should incorporate food quality, price fairness, human staff attentiveness, satisfaction, perceived risk, and brand image into integrated frameworks. Finally, comparative studies across fast-casual versus fine-dining formats would provide deeper operational nuances.

Conclusion

Customer intentions to revisit robot-assisted restaurants depend directly on practical technological utility and operational ease rather than interaction quality alone. Perceived usefulness serves as the primary direct driver of repeat patronage, followed by perceived ease of use. Restaurant managers must focus on delivering reliable, swift, and user-friendly automated encounters while leveraging human staff for high-touch service delivery.

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Conflict of interest

The authors declare no conflict of interest.

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