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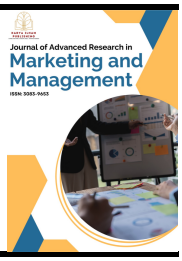

Attitudinal Intention of using Pragmatic Artificial Intelligence on Robotic waiters in a Restaurant Services

Ahasanul Haque[1], Tarekol Islam Maruf[2,*], Amirah Ahmad Suki[1], Jamak Amrollahifar[2], Tasmia Hayath[3]

[1] Department of Business Administration, International Islamic University Malaysia
[2] Department of Business, Management & Technology, Alfa University College, Malaysia
[3] Lee Business School, University of Nevada, Las Vegas, USA

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ABSTRACT

The rapid adoption of AI in the hospitality industry has changed the way services are provided, especially due to a shortage of workers in the restaurant sector. Robotic waiters have emerged as a potential solution to operational issues, but how clients perceive and accept this type of technology remains unclear. The goal of this research is to examine the factors influencing consumers' intentions to use robotic waiters, using the established technology adoption model (TAM) and digital self-determination (DSD). A quantitative research methodology was used with data collected from 267 restaurant clients in Kuala Lumpur. SPSS has been used for descriptive statistics and exploratory factor analysis, and SEM AMOS has been used to test hypotheses and investigate mediation. The findings show that AI-enhanced service quality has a considerable positive impact on perceived usefulness and ease of use, both of which play an important role in determining consumer perceptions. Perceived usefulness was identified as a major mediator between service quality and attitudes, although perceived ease of use had no mediation effect. This study discovered that boosting the quality and perceived value of AI-enabled services can foster positive consumer sentiments, allowing for the effective integration of robotic waiters in restaurants. The findings provide restaurant managers with valuable strategies by demonstrating how perceived usefulness might lead to acceptance. They also help us understand how technology is used in service contexts. The study emphasizes the potential of robotic waiters to alleviate labour shortages while increasing customer satisfaction.

1. Introduction

The integration of technology into individual and social aspects of human life has led to significant advancements in robotics, with global corporations actively developing innovative robotic systems [1]. These advancements are reducing technological disparities and creating new market opportunities [2]. Recent innovations in robotics have resulted in systems capable of interpreting

* *Corresponding author.*
E-mail address: dr.tarekol@alfa.edu.my

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human thoughts and actions [3] with robots increasingly designed to assist people through physical and social interactions.

The restaurant sector, particularly in Malaysia, is experiencing a labor crisis, leading to a growing reliance on robotic servers to enhance service efficiency [4]. Robotic waiters can perform various tasks, such as serving food and taking orders, with the capability to serve 300-400 meals daily compared to 200 by human waiters [5]. The advantages of robotic waiters include error-free task execution and reduced labor costs [6].

The hospitality industry is increasingly adopting service robots for various roles, including waitstaff and housekeeping [7]. The COVID-19 pandemic has exacerbated labor shortages, particularly in Malaysia, where the restaurant industry requires over 40,000 workers [8]. Despite the growing body of research on service robotics, there is a notable gap regarding consumer attitudes toward robotic dining experiences. Understanding customer perceptions of automated dining is crucial, as it differs significantly from traditional dining experiences [9]. This study aims to explore these perceptions and their impact on customer attitudes, thereby contributing valuable insights to both academic literature and the hospitality industry.

2.1 The Theoretical Approach

The Digital Self-Determination (DSD) theory is a specialized extension of the broader Self-Determination Theory (SDT), which explores human personality and motivation [10]. SDT emerged in the 1970s, focusing on the contrast between intrinsic and extrinsic motivations and highlighting the importance of intrinsic motivation in shaping personal behavior. DSD addresses the challenges posed by the digitalization of society, emphasizing the impact on individual and collective agency and autonomy [11]. As society becomes increasingly digital, the realization of self-determination becomes more complex, with DSD reflecting individuals' abilities to control their existence and interactions within digital spaces and technologies. A key concern is ensuring human flourishing in the digital realm [12].

The extent of an individual's self-agency is influenced by their digital environment, which shapes decision-making, access to opportunities, and vulnerability to exploitation. Various digital technologies can either empower or hinder self-determination in areas such as political expression and cultural identity representation. The proposed Regulation on Artificial Intelligence aims to establish guidelines for the ethical use of AI, including prohibitions on practices that could harm individuals' mental or physical well-being.

Additionally, the Technology Acceptance Model (TAM), developed by Davis [13], is based on the Theory of Reasoned Action (TRA) and examines technology usage behaviors. TAM identifies three key factors: perceived usefulness, perceived ease of use, and intention to use. Perceived usefulness relates to the effectiveness of a system, while perceived ease of use refers to the effortlessness of utilizing the system. The model has been validated through significant relationships between these factors and actual usage behaviour.

This study applies the TAM framework and DSD model to assess AI-enabled service quality, considering perceived usefulness and ease of use as stimuli, and attitudes towards usage as the resulting reaction.

2.1 AI Enabled Service Quality

Service quality is a psychological assessment of how well operational procedures meet customer needs [13]. It is defined as the difference between expected and actual service efficacy. Research highlights its significance across various consumer products, including AI-enabled devices [14]. AI as a service (AIAAS) allows affordable experimentation with AI. Robotic waiters enhance service quality through efficiency and convenience, leading to higher customer satisfaction [15].

H1: AI-enabled service quality has a positive impact on perceived usefulness.

H2: The impact of AI-enabled service quality on perceived ease of use is positive.

Perceived Usefulness

Perceived usefulness, as defined by Enholm *et al*., [16], relates to an individual's belief in an information system's ability to enhance work performance. Research by Go *et al*., [17] indicates a positive correlation between the perceived usefulness of robotic waiters and customer adoption. Literature supports that perceived usefulness drives customer interest in AI-based catering services [18].

H3: Attitude towards usage is positively impacted by perceived usefulness.

2.2 Perceived Ease of Use

Ease of use refers to customers' perceptions of how simple a technology is to use [19]. Researchers identify four elements of perceived usability: controllability, comprehension simplicity, accessibility, and user-friendliness. Research indicates that perceived ease of use significantly influences behavioural intent and attitudes towards AI-enabled robot waiters [13,20,29].
H4: Perceived ease of use has a positive effect on attitudes towards use.

2.3 Attitudes towards Using

Attitude towards using (ATU) is defined as an individual's positive or negative perception of a service, such as robot waiters [21]. Research indicates that attitude influences intention, with AI-enabled service quality affecting perceptions of robotic waiters. Studies by Uzir *et al*., [14] and others show perceived usefulness mediates the relationship between service quality and attitudes, while perceived ease of use also plays a mediating role [21,22].

H5: The quality of AI-enabled services has a favourable impact on user attitudes.

H6: The association between AI-enhanced service quality and attitudes towards robotic waiters is mediated by perceived usefulness.

H7: The association between AI-enhanced service quality and attitudes towards robotic waiters is mediated by perceived ease of usage.

2.4 The Conceptual Structure of the Investigation

The conceptual foundation of this study was constructed from prior research whose objective was to determine the factors that influence users' attitudes towards the usage of robotic waiters.

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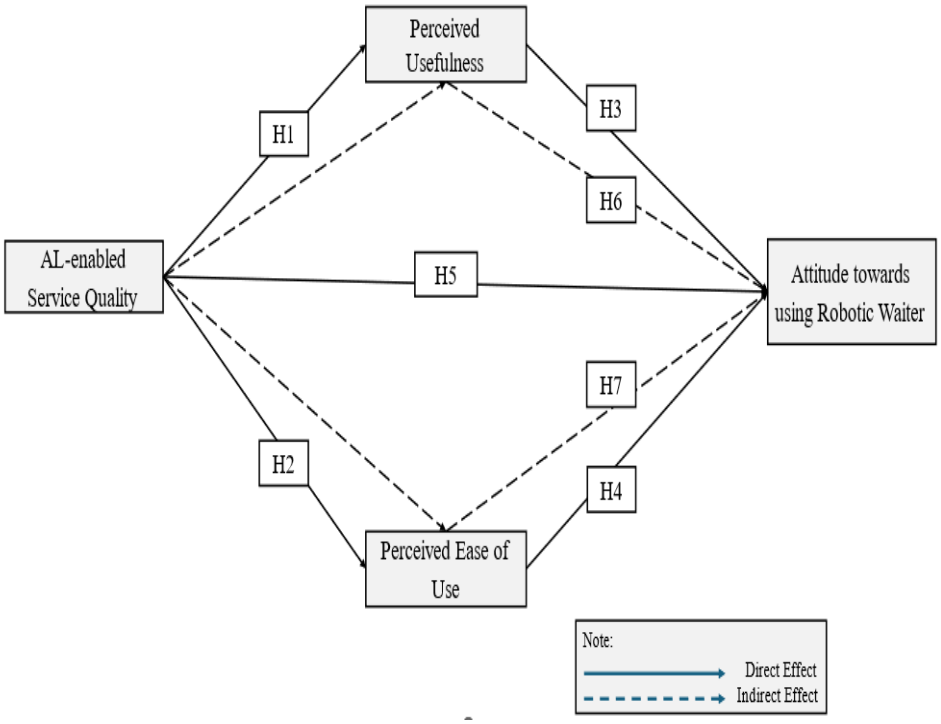

Fig.1. Conceptual framework

3. Methodology

The study employed a quantitative methodology to analyze user attitudes towards robotic waiters in Kuala Lumpur restaurants, chosen for its high tourism concentration. Utilizing convenient sampling, 300 questionnaires were distributed, yielding 278 responses, with 267 deemed usable after removing incomplete ones. The research focused on four constructs: AI-enabled service quality, perceived usefulness, perceived ease of use, and attitudes towards use, using a 5-point Likert. SPSS-28 and AMOS-SEM were used for data analysis and hypothesis validation.

3.1 Demographic Profile

The study involved 267 participants, with 43.4% male and 53.6% female. Age distribution showed 25.8% were aged 24-29, while 7.5% were 48-53. Most respondents (76.5%) were single, and the highest occupation category was unemployed (30.0%). Income levels varied, with 32.6% earning RM 8K-9K. Detailed demographics are presented in Table 1.

3.2 Analysis of Exploratory Factors

An exploratory factor analysis (EFA) was conducted to explore relationships among interrelated variables [23]. The Kaiser-Meyer-Olkin (KMO) value was 0.681, surpassing the 0.50 threshold, and Bartlett's Test of Sphericity yielded a p-value of 0.000, confirming the data's suitability for EFA. Using principal component analysis and varimax rotation four components emerged, but parameters PU2, ATU3, and PEOU4 were removed to enhance factor loading independence.

3.3 Testing Reliability and Validity

This study assessed reliability using Cronbach's alpha and Construct Reliability (CR) via SPSS and AMOS software.

Table 1
Factor loading, AVE, and CR for constructs

Constructs	Items	Factor Loading	Cronbach's α	AVE	CR
PEOU	PEOU1	0.89	0.86	0.78	0.92
	PEOU2	0.90			
	PEOU3	0.87			
AESQ	AESQ1	0.70	0.73	0.50	0.79
	AESQ2	0.63			
	AESQ3	0.75			
	AESQ4	0.71			
PU	PU1	0.84	0.90	0.82	0.93
	PU2	0.94			
	PU3	0.95			
ATU	ATU1	0.87	0.86	0.75	0.90
	ATU2	0.89			
	ATU4	0.85			

Cronbach's alpha values exceeded the 0.70 threshold as per [24] with all constructs showing no reliability issues (See Table 1). The Composite Reliability (CR) and Average Variance Extracted (AVE) were also evaluated, with AVE values for PEOU (0.78), AESQ (0.50), PU (0.82), and ATU (0.75) indicating convergent validity, as CR values ranged from 0.79 to 0.93.

3.4 Structural Model

Figure 2 depicts the modified structural model, which fits with a CFI of 0.941, more significant than the cutoff value of 0.90, and an RMSEA of 0.079, which meets the criteria. The normed Chi-square value of 2.662 is less than five, which helped the structural model fit, and has 56 degrees of freedom, and the chi-square is 149.064. Therefore, the structure model remains fitted.

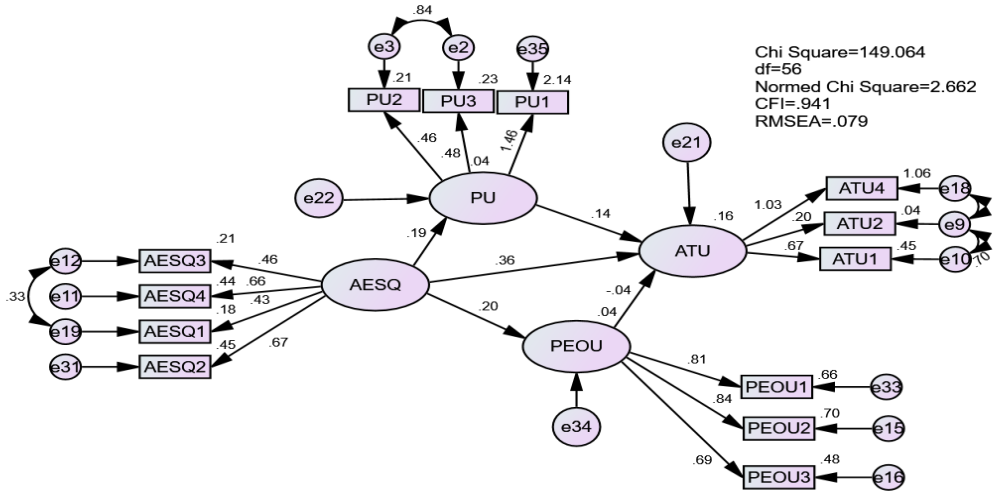

Fig. 2. Structural model

Based on the SEM model (Figure 2), table 1 displays the estimated paths between the constructions. Table 2 Path Estimation.

Table 2
Path estimation

Hypothesis	Path	Standardized Regression Weight	Standard Error (SE)	Critical Ratio (CR)	p-value	Result
H1	AI-Enabled Service Quality → Perceived Usefulness	0.14	0.07	1.97	<0.05	Supported
H2	AI-Enabled Service Quality → Perceived Ease of Use	0.26	0.11	2.40	<0.05	Supported
H3	Perceived Usefulness → Attitude Towards Use	0.31	0.07	4.10	<0.001	Supported
H4	Perceived Ease of Use → Attitude Towards Use	-0.02	0.06	0.89	0.375	Not Supported
H5	AI-Enabled Service Quality → Attitude Towards Use	0.57	0.12	4.81	<0.001	Supported

4. Results Interpretation

4.1 Hypothesis Testing

The analysis of the model's structural path indicates that AI-enabled service quality significantly influences perceived utility, with a standardized regression weight of 0.14, a standard error of 0.07, and a critical ratio of 1.97, surpassing the critical threshold of 1.96 [25]. This led to the rejection of the null hypothesis, confirming a positive relationship between AI-enabled service quality and perceived usefulness in the context of AI-enabled robotics waiters. Further hypothesis testing revealed a significant structural path between AI-enabled service quality and perceived ease of use,

with a standardized regression weight of 0.26 and a critical ratio of 2.40, reinforcing the positive influence of service quality on perceived utility [26]. The third hypothesis showed a significant positive effect of perceived usefulness on attitudes towards robotic waiters, with a standardized regression weight of 0.31 [20,21]. However, the relationship between perceived ease of use and attitude was insignificant, with a standardized regression weight of -0.0. Lastly, a strong positive correlation was found between AI-enabled service quality and user attitude (standardized weight of 0.57), leading to the rejection of the null hypothesis [27,28].

4.2 Mediation Effect Analysis

Three relationships assess whether a concept mediates between two others: the direct effect of the independent variable on the dependent variable, the indirect effect with the mediating construct, and the relationship between the mediating and dependent variables. Table 1 presents estimated paths from the SEM model (Figure 2).

Hypothesis Six (H6) posits that perceived utility (PU) mediates the relationship between AI-enabled service quality (AESQ) and attitude toward use (ATU). The analysis shows a significant relationship between AESQ and PU (path value = 0.14, CR = 1.97), and between AESQ and ATU (path value = 0.57, CR = 4.81). Furthermore, the connection between PU and ATU is also significant (path value = 0.31, CR = 4.15). This indicates that PU mediates the relationship between AESQ and ATU, confirming H6a. In contrast, Hypothesis Seven (H7) suggests that perceived ease of use (PEOU) mediates the same relationship. While the relationship between AESQ and PEOU is significant (path value = 0.26, CR = 2.40), the link between PEOU and ATU is statistically insignificant (path value = 0.05, CR = 0.89). Thus, H7 is invalid, indicating that PEOU does not mediate the relationship between AESQ and ATU.

5. Conclusion and Future Directions

This study provides empirical evidence that AI-enabled service quality has a significant impact on user attitudes toward robotic waiter systems, perceived usefulness, and perceived ease of use. It is based on the Digital Self-Determinant (DSD) paradigm and the Technology Acceptance Model (TAM). The findings support the theoretical significance of perceived usefulness in technology adoption research by highlighting its crucial mediation role. More significant than operational simplicity are the opinions of customers regarding the usefulness and effectiveness of AI-enabled services. This demonstrates that usefulness, rather than ease of use, is a more significant adoption element in technologically advanced service contexts.

A subtle theoretical insight is offered by the lack of a mediating effect for perceived ease of use: in technologically advanced settings like Kuala Lumpur, users may already be fundamentally accustomed to AI interfaces, making usability less noticeable. By showing how cultural familiarity, technical exposure, and environmental preparation interact to influence human cognition and technology adoption, this research broadens the scope of the Technology Adoption Model (TAM). It becomes even more evident how crucial autonomy, competence, and relatedness are to comprehending how consumers engage with intelligent service technology when TAM is combined with the DSD paradigm.

From a managerial perspective, the results have clear implications for hospitality sector personnel. Restaurant managers and service designers should prioritize emotional responsiveness, personalization, and dependability when implementing AI. These elements help customers feel good about the service and give them the impression that it is valuable. In situations where AI is employed,

strategic human-robot collaboration and employee training can further increase consumer constancy.

Despite its strengths, the study's cross-sectional design and small sample limit its ability to draw conclusions about causality and generalizability. To support these connections throughout time and in many situations, future research should use cross-cultural, cross-industry, and longitudinal approaches. Understanding the dynamics of user-AI interactions may be improved by extending the model to look into trust, and societal effect as mediators or moderators.

References

[1] Griffy-Brown, Charla, Brian D. Earp, and Omar Rosas. "Technology and the good society." *Technol. Soc* 52, no. 1 (2018): 1-5. https://doi.org/10.1016/j.techsoc.2018.01.001

[2] Lee, Jaehun, Taewon Suh, Daniel Roy, and Melissa Baucus. "Emerging technology and business model innovation: the case of artificial intelligence." *Journal of Open Innovation: Technology, Market, and Complexity* 5, no. 3 (2019): 44. https://doi.org/10.3390/joitmc5030044

[3] Hsia, Chih-Hsien, Chin-Feng Lai, and Yu-Sheng Su. "Impact of using ARCS model and problem-based leaning on human interaction with robot and motivation." *Library Hi Tech* 40, no. 4 (2022): 963-975. https://doi.org/10.1108/LHT-07-2020-0182

[4] Abhari, Sara, Alireza Jalali, Mastura Jaafar, and Reza Tajaddini. "The impact of Covid-19 pandemic on small businesses in tourism and hospitality industry in Malaysia." *Journal of Research in Marketing and Entrepreneurship* 24, no. 1 (2022): 75-91. https://doi.org/10.1108/JRME-07-2020-0091

[5] Aydın, İbrahim. "Investigation of the effect of robot waiter usage desire on word of mouth communication and robot waiter usage attitude in restaurants." *Turkish Business Journal* 2, no. 4 (2021): 93-105. https://doi.org/10.51727/tbj.1025863

[6] Ivanov, Stanislav, and Craig Webster. "Willingness-to-pay for robot-delivered tourism and hospitality services–an exploratory study." *International Journal of Contemporary Hospitality Management* 33, no. 11 (2021): 3926-3955. https://doi.org/10.1108/IJCHM-09-2020-1078

[7] Maruf, Tarekol Islam, Ahmed Md Kowsar, AKM Ahsanul Haque, Mohammad Masud Siddique, Nadia Sohail, and Motia Mannan. "THE FUTURE OF DINING: ROBOTICS HAND-IN RESTAURANT SERVICE REVOLUTIONIZES USAGES EXPERIENCE IN KUALA LUMPUR."

[8] Gu, Huimin, Bin Li, Chris Ryan, Yue Tang, and Xu Yang. "From darkest to finest hour: recovery strategies and organizational resilience in China's hotel industry during the COVID-19 pandemic." *Journal of China Tourism Research* 19, no. 1 (2023): 7-30. https://doi.org/10.1080/19388160.2022.2164100

[9] Liu, Haiying, Nan Jiang, Geovanny Genaro Reivan Ortiz, Phan The Cong, Tran Thi Thu Phuong, and Worakamol Wisetsri. "Exploring tourism business model importance with the emergence of blockchain system: directions for tourism industry of China." *Environmental Science and Pollution Research* 30, no. 16 (2023): 46647-46656. https://doi.org/10.1007/s11356-023-25199-y

[10] Olafsen, Anja H., and Edward L. Deci. "Self-determination theory and its relation to organizations." In *Oxford research encyclopedia of psychology*. 2020. https://doi.org/10.1093/acrefore/9780190236557.013.112

[11] Remolina, Nydia, and Mark Findlay. "The paths to digital self-determination-A foundational theoretical framework." *SMU Centre for AI & Data Governance Research Paper* 03 (2021). https://doi.org/10.2139/ssrn.3831726

[12] Berkman Klein Center for Internet and Society at Harvard University, "Digital self-determination calls for participants," 2021. [Online]. Available: https://cyber.harvard.edu/story/2021-02/call-participants

[13] Davis, Fred D. "Technology acceptance model: TAM." *Al-Suqri, MN, Al-Aufi, AS: Information Seeking Behavior and Technology Adoption* 205, no. 219 (1989): 5.

[13] Uzir, Md Uzir Hossain, Hussam Al Halbusi, Rodney Lim, Ishraq Jerin, Abu Bakar Abdul Hamid, Thurasamy Ramayah, and Ahasanul Haque. "Applied Artificial Intelligence and user satisfaction: Smartwatch usage for healthcare in Bangladesh during COVID-19." *Technology in society* 67 (2021): 101780. https://doi.org/10.1016/j.techsoc.2021.101780

[14] Li, Minglong, Dexiang Yin, Hailian Qiu, and Billy Bai. "Examining the effects of AI contactless services on customer psychological safety, perceived value, and hospitality service quality during the COVID-19 pandemic." *Journal of Hospitality Marketing & Management* 31, no. 1 (2022): 24-48. https://doi.org/10.1080/19368623.2021.1934932

[15] I. M. Enholm, E. Papagiannidis, P. Mikalef, and J. Krogstie, "Artificial intelligence and business value: A literature review," Inf. Syst. Front., pp. 1–26, 2021. https://doi.org/10.1007/s10796-021-10186-w

[16] Go, Hanyoung, Myunghwa Kang, and SeungBeum Chris Suh. "Machine learning of robots in tourism and hospitality: interactive technology acceptance model (iTAM)–cutting edge." *Tourism review* 75, no. 4 (2020): 625-636. https://doi.org/10.1108/TR-02-2019-0062

[17] Hwang, Jinsoo, Heather Kim, Jinkyung Jenny Kim, and Insin Kim. "Investigation of perceived risks and their outcome variables in the context of robotic restaurants." *Journal of Travel & Tourism Marketing* 38, no. 3 (2021): 263-281. https://doi.org/10.1080/10548408.2021.1906826

[18] Maruf, Tarekol Islam, N. H. B. A. Manaf, A. K. M. A. Haque, and Suharni Bt Maulan. "Factors affecting attitudes towards using ride-sharing apps." *International Journal of Business, Economics and Law* 25, no. 2 (2021): 60-70.

[19] Siagian, Hotlan, Zeplin Jiwa Husada Tarigan, and Sahnaz Ubud. "The effect of electronic word of mouth on online customer loyalty through perceived ease of use and information sharing." PhD diss., Petra Christian University, 2022. https://doi.org/10.5267/j.ijdns.2022.7.004

[20] Choe, Ja Young, Jinkyung Jenny Kim, and Jinsoo Hwang. "Innovative robotic restaurants in Korea: merging a technology acceptance model and theory of planned behaviour." *Asian Journal of Technology Innovation* 30, no. 2 (2022): 466-489. https://doi.org/10.1080/19761597.2021.2005466

[21] Kao, Wei-Kang, and Yu-Shan Sandy Huang. "Service robots in full-and limited-service restaurants: Extending technology acceptance model." *Journal of Hospitality and Tourism Management* 54 (2023): 10-21. https://doi.org/10.1016/j.jhtm.2022.11.006

[21] Song, Christina Soyoung, and Youn-Kyung Kim. "The role of the human-robot interaction in consumers' acceptance of humanoid retail service robots." *Journal of Business Research* 146, no. 2 (2022): 489-503. https://doi.org/10.1016/j.jbusres.2022.03.087

[23] Haque, Ahasanul, Arun Kumar Tarofder, Tarekol Islam Maru, Ismail Raisal, and Mohammad Shamsuddoha. "Brand image and smartphone purchase intention in Malaysia: the mediating role of perceived value and perceived quality." (2023).

[24] Daud, Khairul Azhar Mat, Nik Zulkarnaen Khidzir, Ahmad Rasdan Ismail, and Fadhilahanim Aryani Abdullah. "Validity and reliability of instrument to measure social media skills among small and medium entrepreneurs at Pengkalan Datu River." *International Journal of Development and sustainability* 7, no. 3 (2018): 1026-1037.

[25] Cui, Yuanyuan, Patrick van Esch, and Shailendra Pratap Jain. "Just walk out: the effect of AI-enabled checkouts." *European Journal of Marketing* 56, no. 6 (2022): 1650-1683.

[26] Manser Payne, Elizabeth H., Andrew J. Dahl, and James Peltier. "Digital servitization value co-creation framework for AI services: a research agenda for digital transformation in financial service ecosystems." *Journal of Research in Interactive Marketing* 15, no. 2 (2021): 200-222. https://doi.org/10.1108/JRIM-12-2020-0252

[27] Nguyen, Tuyet-Mai, and Ashish Malik. "Impact of knowledge sharing on employees' service quality: the moderating role of artificial intelligence." *International Marketing Review* 39, no. 3 (2022): 482-508. https://doi.org/10.1108/IMR-02-2021-0078

[28] Haque, Ahasanul, Tarekol Islam Maruf, Naznin Akther, S. M. H. Kabir, and Zohurul Anis. "Users Behavioral Intentions in Adoption of AI-Enabled Robotic Waiter Services."

[29] Hayath, Tasmia, and Tarekol Islam Maruf. "TikTok's Global Takeover: Algorithms, Audiences, and the Future of Social Media." IIUM Journal of Case Studies in Management 16, no. 2 (2025).