“Optimizing digital menu experiences to foster restaurant loyalty: The moderating role of system satisfaction”

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OPTIMIZING DIGITAL MENU EXPERIENCES TO FOSTER RESTAURANT LOYALTY: THE MODERATING ROLE OF SYSTEM SATISFACTION

Abstract

Digital menu systems have revolutionized restaurant operations by catering to consumers' demand for convenience and personalized dining experiences. However, the performance of the ordering system varies across restaurants, making it essential to understand how digital menu system satisfaction influences key drivers of dining experience. Cross-sectional, self-administered online survey (convenience sampling) was conducted among 448 Malaysian restaurant patrons from December 2023 to May 2025 to capture recent dining behavior. Respondents were recruited from a broad range of income groups and dining contexts across urban, suburban, and rural areas in Malaysia, encompassing experiences at low-cost casual eateries, mid-range family, chain restaurants, and upscale venues, thereby capturing socioeconomic variation. The study examines the relationship between performance expectancy, effort expectancy, visual appeal, and perceived engagement, as well as their impact on restaurant loyalty, with the moderating role of satisfaction with digital menu systems. The analysis, conducted using Partial Least Squares Path Modeling (PLS-PM) in SmartPLS 4, assessed the relationships between variables. The results show that performance expectancy ($\beta = 0.173$, $p < 0.002$), effort expectancy ($\beta = 0.208$, $p < 0.001$), visual appeal ($\beta = 0.262$, $p < .001$), and perceived engagement ($\beta = 0.189$, $p < 0.001$) positively predict restaurant loyalty, explaining $R^2 = 57\%$ of variance in loyalty. Nevertheless, digital menu system satisfaction moderates only the relationship between visual appeal and restaurant loyalty (interaction $\beta = 0.089$, $p = 0.042$). The findings demonstrate that well-designed digital menu systems enhance order accuracy, navigation, and decision-making, highlighting the importance of functionality and visual design in fostering customer loyalty.

Keywords digital menu system, performance expectancy, effort expectancy, visual appeal, perceived engagement, system satisfaction, restaurant loyalty

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INTRODUCTION

The restaurant industry has witnessed a significant rise in the adoption of digital menu systems. This trend is primarily driven by the growing demand for contactless solutions and operational efficiency, as highlighted by recent studies (Alfehaid et al., 2024; Ayad & Hasanein, 2024). The need for reduced physical interaction and streamlined processes has become increasingly important, particularly in the current digital era. Restaurants are increasingly relying on digital technologies, platforms, tools, applications, and websites to make food ordering processes convenient and contactless (Alfehaid et al., 2024; Sahin, 2020). These applications and tools enable consumers to browse menus, place orders, and make payments remotely, minimizing the need for physical interaction with restaurant staff. The adoption of digital menu sys-

tems in the restaurant industry is a testament to the transformative power of technology in reshaping how food businesses operate and interact with their customers (Alfehaid et al., 2024; Ayad & Hasanein, 2024; Sahin, 2020).

Recent statistics reported that 60% of diners prefer mobile applications for food ordering, while 85% of customers expect restaurants to offer digital ordering options. Furthermore, 80% of the restaurant operators have implemented a digital menu system, and 65% of the fast food restaurants have incorporated self-service food ordering kiosks (Gitnux, 2025). For instance, the advancement of food services in China has profoundly altered dining habits. In 2024, statistics showed that 592 million individuals used online food delivery services. The statistic reflects the integration of digitalization into the food industry, which allows people to access digital menus and submit orders via restaurants' applications before being seated. It has also been incorporated into the widespread adoption of digital payment solutions, such as quick response (QR) code scanning, across various food service providers (Statista, 2025). Moreover, digital transactions account for about 50% of restaurant sales (WifiTalents, 2025). The statistics indicate that consumers are increasingly relying on device applications for food ordering, and restaurants are reacting by implementing digital ordering options.

With the rise of digital technology, traditional restaurant menus have been gradually replaced with digital menus, which significantly impact consumer decisions and behavior (Bawazir et al., 2023). From a favorable perspective, proponents argue that integrating digital menu systems with self-service technologies enhances convenience, interactivity, and overall restaurant performance (Lee et al., 2021; Lin et al., 2023). However, opposing evidence suggests that unintended consequences may occur, where customers may take a longer period to place orders with digital interfaces. The excessive automation can weaken human connection and negatively impact purchase decisions (Fan & Mattila, 2020; Leung et al., 2021). In contrast, several existing studies suggest that human interaction continues to influence purchasing decisions significantly (Leung et al., 2021; Yoganathan et al., 2021).

Despite the widespread adoption of digital menu systems, implementation strategies often prioritize functional deployment over deliberate optimization of the user experience (Bawazir et al., 2023; Lee et al., 2021; Lin et al., 2023). As a result, there is limited empirical evidence to show whether a digital menu system alone yields enhanced service quality or stronger customer loyalty (Lin et al., 2023; Noorkhizan et al., 2023). A persistent empirical gap concerns which specific digital menu system features drive loyalty and under which conditions those effects hold. In particular, the relative roles of performance expectancy, effort expectancy, perceived engagement, and visual appeal remain unclear, as does the extent to which overall satisfaction with the digital menu system surrounds these relationships. Filling this gap is necessary to move beyond adoption metrics and to understand the mechanisms by which digital menu systems influence consumer behaviour and long-term patronage.

1. LITERATURE REVIEW AND HYPOTHESES

Research examining digital technologies in restaurant contexts typically focuses on how customers evaluate the functional and experiential benefits of these systems. Existing studies on consumer interactions with digital technologies in restaurant settings have primarily focused on users' assessments of usefulness and ease of use (Ayad & Hasanein, 2024; Bawazir et al., 2023; Liu et al., 2025). These evaluations are closely aligned with the concepts of performance expectancy and effort expectancy, as outlined in the Unified Theory of Acceptance and Use of Technology (UTAUT) framework proposed by Venkatesh et al. (2003). While originally applied in organizational contexts, UTAUT2 was introduced to better capture consumer technology adoption (Venkatesh et al., 2012). Consequently, the model has been extended to consumer-facing technologies, including mobile ordering platforms, self-service kiosks, and in-application food delivery services (Jeon et al., 2020; Verdania Latif, 2021). These studies reinforce the applicability of its core

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constructs in hospitality environments, where digital tools increasingly facilitate the customer experience (Ayad & Hasanein, 2024). Although the current study does not adopt UTAUT2 entirely, it draws conceptually from its core constructs, particularly the performance expectancy and effort expectancy, to understand how consumers assess the value and usability of digital menu systems.

To augment the argument from a theoretical lens, equity theory offers complementary value by incorporating consumers' evaluations of fairness in the service exchange. Equity theory posits that individuals assess the balance between their inputs and the outcomes they receive, which forms their perceived equity, significantly influencing their emotional and behavioral responses (Adams, 1965). In service environments like restaurants, where digital interfaces such as digital menu systems influence the customer experience (Ayad & Hasanein, 2024), such judgments are particularly salient. The equity theory provides a foundation for understanding what drives individuals to exhibit specific behavior and how they respond to relationships. A primary goal is to predict human behavior by evaluating the relative outcomes of interactions (Walster et al., 1973). Drawing from the principle of equity theory, consumers' judgments and perceptions of exchange for digital menu systems provided by restaurants are fundamental to understanding their overall satisfaction and loyalty.

Restaurant loyalty now operates within a digitalized environment where service delivery, communication, and value exchange are increasingly shaped by technology. This shift requires revisiting classical loyalty definitions to account for digitally enabled behaviours. For instance, both repeated transactions and online advocacy reflect sustained customer bonds with the brand. Restaurant loyalty has undergone a significant conceptual evolution, particularly in the digital era, where traditional loyalty paradigms have been challenged by technological disruption and changing consumer behavior (Chang et al., 2009; Leong et al., 2023; Na Nongkhai et al., 2024). In the typical restaurant industry, loyalty reflects a customer's sustained dedication to a restaurant brand, as evidenced by behavioral consistency and attitudinal advocacy (Dirsehan & Cankat, 2021). For example, a loyal customer makes repeated purchases or voluntarily recommends the restaurant to others (Dirsehan & Cankat, 2021). However, the rise of digital technologies has also transformed how restaurants interact with customers and build loyalty. Tools such as digital menus, online ordering systems, and social media platforms have created new opportunities for restaurants to engage with customers and provide personalized experiences (Ayad & Hasanein, 2024; Lin et al., 2023; Noorkhizan et al., 2023). Therefore, the converging restaurant loyalty encompasses both behavioural repetition and digital advocacy, and it is increasingly contingent on the quality of digital touchpoints. Thus, evaluating loyalty today requires integrating traditional measures with metrics that capture digitally mediated satisfaction and engagement.

Reflecting the digital transformation, this study defines restaurant loyalty as a multi-faceted concept with distinct aspects. It includes the conventional metric of behavioral loyalty, based on the frequency with which customers return. Meanwhile, attitudinal loyalty encompasses customers' positive ratings and advocacy toward restaurants. It is a crucial aspect of restaurant loyalty, particularly for restaurants that utilize digital menu systems (Dirsehan & Cankat, 2021; Na Nongkhai et al., 2024). For example, there is a tendency to express positive opinions, make recommendations, and encourage others to visit restaurants that utilize the digital menu systems for food ordering, thereby reflecting loyalty toward these establishments. In particular, digital menu systems serve as a means to bridge restaurant loyalty and the broader adoption of technology in the restaurant industry.

Efficient task completion is a primary driver of technology adoption in consumer settings, especially where speed and accuracy directly affect customer satisfaction. Examining how expected performance gains shape behavior helps explain why some digital tools become routine while others do not. The performance expectancy is a critical determinant in the adoption of new technologies, a concept extensively validated within the UTAUT framework (Venkatesh et al., 2003; Venkatesh et al., 2012). It is defined as the degree to which an individual believes that using a particular system will help them attain gains in task performance (Venkatesh et al., 2003). This study defines performance expectancy as the user's belief that a digital menu system will enhance ordering efficiency or outcomes (Jeon et al.,

2020; Qi et al., 2021). This could lead to faster ordering, reduced human errors, simplified menu navigation, and improved order customization capabilities in the restaurant industry. Performance expectancy captures the pragmatic value diners expect from digital menu systems and is linked theoretically and empirically to satisfaction and repeated use.

Consequently, smooth, reliable ordering experiences are central to how diners evaluate a restaurant's service quality and decide whether to return. A positive experience with food ordering processes can foster customer satisfaction and loyalty toward a restaurant (Dirsehan & Cankat, 2021). Existing studies have demonstrated that customers' perceived value has a significant impact on customer loyalty (Indrawati, 2021; Yuen et al., 2023). Furthermore, previous studies have also proven that fulfilling users' performance and usability expectations is key to driving satisfaction and loyalty (Beibei et al., 2025), as well as promoting the continued adoption of technology (Anggraeni et al., 2024; Wijemanna & Sachithra, 2024). It suggests that the alignment between perceived ease of use and perceived usefulness can foster customer loyalty, as customers are more likely to return to a service that meets their expectations and needs. The existing studies support the proposition that when customers believe the digital menu systems enhance their performance, it fosters the likelihood of returning.

On the other hand, the ease of interaction is a decisive factor in whether consumers adopt and continue using new service technologies, especially in fast-paced service settings such as restaurants. Effort expectancy is a crucial factor in the implementation of digital menu systems. Venkatesh et al. (2003) defined effort expectancy as the perceived simplicity of operating or engaging with the system. It reflects users' perceptions of how effortless it is to learn and interact with a technology. The effort expectancy has been consistently proven to be a key driver of behavioral intention, particularly in the early stage of technology adoption (Venkatesh et al., 2003; Venkatesh et al., 2012). When the system is perceived as intuitive and easy to navigate, it is more likely to be adopted and integrated into routine behavior (Venkatesh et al., 2012). In this study, effort expectancy refers to the perceived ease of learning and clarity of interaction with digital menu systems (Alalwan, 2020). Consumers' perceived ease of use is determined by their expected level of effort required to understand and operate the system (Rachmad et al., 2024). Prior studies have established a positive relationship between effort expectancy and intention to maintain continuity (Anggraeni et al., 2024; Wijemanna & Sachithra, 2024). Moreover, previous research has found a connection between effort expectancy and loyalty (Beibei et al., 2025). When the adopted technology reliably delivers on its promises of performance and ease of use, users are more likely to be satisfied and remain loyal.

Furthermore, menu descriptions and visual design play a central role in how diners form expectations and make choices. They translate culinary offerings into perceived value before consumption. Menu description is a vital communication tool in restaurants. It informs customers about the offered dishes (Brewer & Sebby, 2021). Digital menu systems enhance functionality through an intuitive, interactive touchscreen that invites diners to swipe, scroll, and navigate across well-organized categories, including appetizers, main courses, desserts, beverages, and more (Noorkhizan et al., 2023). When a diner selects a dish, the system instantly displays its description, price, and often a vivid photograph, providing a clear and immersive preview of the cuisine (Lee & Lim, 2023; Noorkhizan et al., 2023). In this study, an appealing visual is defined as the extent to which the aesthetic and design elements of a digital menu system evoke a pleasant and easy-to-view experience for diners (Brewer & Sebby, 2021). Clear descriptions shared with high-quality visual presentations reduce decision friction and increase the persuasive power of the menu.

Also, visual presentation is a primary sensory cue that guides attention and shapes pre-purchase evaluations in foodservice contexts. Digital menus amplify these visual signals, transforming layout, imagery, and typographic choices into powerful drivers of desire and decision-making. Visually engaging menu interfaces have been shown to influence food desire and further contribute to purchase intention (Gopal et al., 2024). The way the menu is presented, encompassing layout, typography, and visual elements, plays a crucial role in drawing customers' attention and sparking interest in the available offers (Low & Hassan, 2024; Rianmora et al., 2024). Empirical studies consistently link the appealing visual to behavioral intention as well as

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purchase intention (Salisu et al., 2024), the desire for food (Brewer & Sebby, 2021; Gopal et al., 2024), and loyalty (Arun et al., 2025). In particular, the visual appeal through food photography is critical in shaping consumer behavior and fostering loyalty. For instance, a study by Arun et al. (2025) showed that over half of the respondents (53.3%) indicated a higher likelihood of visiting a restaurant if the food appeared appealing in photographs. Additionally, 46.7% of respondents reported trusting food photos on social media when making dining decisions, suggesting that visually driven content on digital platforms has a significant influence on consumers' restaurant choices (Arun et al., 2025). Thus, the visual appeal operates both as an attention-capturing stimulus and as an affective cue that will increase the purchase propensity.

User engagement with digital interfaces extends beyond usability to include the degree of psychological immersion and active participation a system elicits. Perceived engagement is characterized by users' psychological immersion and interactive involvement with a system (Mohamed et al., 2022; Yim & Yoo, 2020). In the digital environment, the perceived engagement reflects the depth of an individual's attentional focus and active participation (Hassan & Low, 2024; Sadanala et al., 2025). Hence, perceived engagement is conceptualized as users' cognitive and behavioral involvement when interacting with digital menu systems. Drawing on Yim and Yoo (2020), perceived engagement emphasizes users' sense of autonomy, the responsiveness of the system, and its customization capabilities, which contribute to a more immersive experience. Consequently, perceived engagement is posited to support purchase decisions and promote repeat patronage when digital menu systems are well established.

Feelings of social connection and platform belonging shape how consumers relate to digital services and influence their willingness to maintain ongoing interactions. A customer's perception of belonging to an online platform or e-commerce site can foster a desire to maintain a long-term connection, which in turn leads to increased purchase intentions. As this relationship between customers and online businesses deepens, it can ultimately lead to enhanced customer loyalty (Taghizadeh et al., 2021). Furthermore, empirical evidence suggests that perceived engagement is positively correlated with enhanced individual attitudes (Hoesch et al., 2025). Previous studies have established the link between perceived engagement or interaction and subsequent behavioral intentions (Almusfar, 2025; Tanhaei et al., 2024). Enhancing users' sense of membership and interactive involvement with a restaurant through the use of digital menu systems can therefore increase subsequent consumer engagement behavior.

Nonetheless, satisfaction is the direct outcome of practical marketing efforts, linking the purchase and consumption stages to the subsequent post-purchase situation. Fulfilling consumer needs is essential to shaping future continuity behavior and underpins long-term profitability (Mohamed et al., 2022). Meanwhile, digital menu system satisfaction is described as a user's overall evaluative judgment, encompassing both cognitive and affective responses to a restaurant's digital menu ordering experience. It reflects how well the system meets one's needs and expectations, conveying service quality and eliciting positive feelings (Dirsehan & Cankat, 2021). High satisfaction with a digital menu system indicates that the system meets both functional and emotional needs, with the potential to strengthen continuance behavior and support long-term profitability. Measuring satisfaction, therefore, provides a direct indicator of a digital menu's success in generating sustainable customer value.

However, the empirical findings of technology-acceptance constructs do not always produce consistent results, prompting closer scrutiny of boundary conditions that shape when predictors matter. Although performance expectancy is theorized to drive behavioral intention, several studies have reported a non-significant relationship between performance expectancy and behavioral intention (Susanto et al., 2024; Yuliantie, 2024). Moreover, several empirical studies have failed to demonstrate a significant relationship between effort expectancy and behavioral intention (Hafizh et al., 2024; Susanto et al., 2024). Furthermore, the inconsistent findings have also extended to impulsive behavioral intention. For instance, an empirical study showed that visual appeal exerts no significant effect on impulse buying (Hayati & Salim, 2025). Additionally, the prior study found that engagement did not significantly im-

pact adoption intention (Cudjoe et al., 2023). In such conditions, moderator variables are typically added to a model when the association between a predictor and the outcome variable is unexpectedly inconsistent (Baron & Kenny, 1986). In summary, the inconsistent empirical relationships suggest the presence of context-specific moderators that alter the relationships between the predictor and the outcome variable. Including moderators can reveal conditional processes and enhance explanatory power, enabling researchers and practitioners to target interventions more precisely.

User evaluations of service technologies are rarely uniform. They depend on prior experiences, expectations, and the emotional responses those interactions generate. Treating satisfaction solely as an outcome overlooks its role in shaping how users perceive and respond to subsequent service attributes and cues. Several studies have examined satisfaction as a moderating variable in various behavioral studies (Ngirande, 2021; Nukhu & Singh, 2024; Ohunakin & Olugbade, 2022). There is a need to consider satisfaction not merely as a direct predictor of behavior, as satisfaction emerges from confirming prior expectations and experiences (Nukhu & Singh, 2024). This study posits that digital menu system satisfaction serves as a moderating variable, shaping how performance expectancy, effort expectancy, visual appeal, and perceived engagement are interpreted in terms of restaurant loyalty.

The objective of this study is to investigate how digital menu system features influence restaurant loyalty among Malaysian consumers. As the restaurant industry embraces digital transformation, digital menu systems have evolved from static displays to interactive platforms that shape customer experience. These systems not only streamline ordering but also affect perceptions of usability, engagement, and visual appeal. This study examines how the impact of performance expectancy, effort expectancy, visual appeal, and perceived engagement influences restaurant loyalty. Furthermore, digital menu system satisfaction is posited as a moderating factor that may strengthen or weaken these relationships. Figure 1 illustrates that the proposed model encompasses four direct predictors of restaurant loyalty: performance expectancy, effort expectancy, visual appeal, and perceived engagement. Additionally, it examines the moderating role of digital menu system satisfaction on each of these relationships.

Grounded in existing literature and empirical evidence, the study proposes the following hypotheses:

H1: *Performance expectancy positively influences restaurant loyalty.*

H2: *Effort expectancy positively influences restaurant loyalty.*

H3: *Visual appeal positively influences restaurant loyalty.*

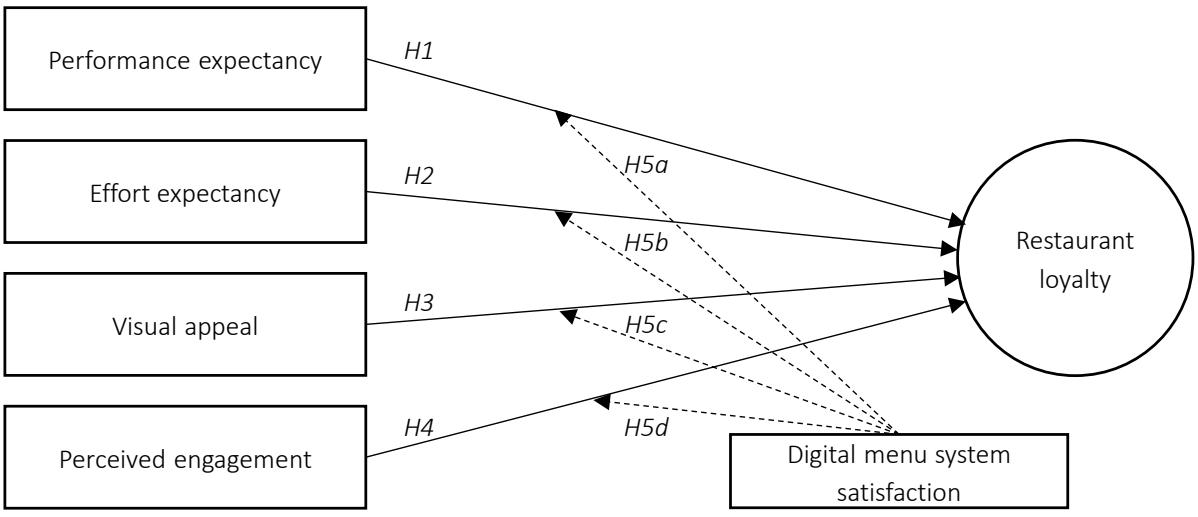

Figure 1. The research framework

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H4: Perceived engagement positively influences restaurant loyalty.

H5a: The relationship between performance expectancy and restaurant loyalty will be stronger when the satisfaction level of the digital menu system is higher.

H5b: The relationship between effort expectancy and restaurant loyalty will be stronger when the satisfaction level of the digital menu system is higher.

H5c: The relationship between visual appeal and restaurant loyalty will be stronger when the satisfaction level of the digital menu system is higher.

H5d: The relationship between perceived engagement and restaurant loyalty will be stronger when the satisfaction level of the digital menu system is higher.

2. METHODOLOGY

The study targeted Malaysian individuals who had dined at restaurants and regularly used digital menu systems to place food and beverage orders. At the beginning of the questionnaire, the researchers implemented two screening checks: (1) dichotomous item asking whether the respondent had used a restaurant's digital menu system in the past six months, and (2) item requiring the respondent to name the restaurant they most recently visited. Only respondents who answered "yes" to the first item and provided a verifiable restaurant name continued to the main survey. Those who failed either check were routed to the survey end and excluded from analysis. These eligibility criteria ensured that all respondents had recent, experiential knowledge of digital-menu ordering and could provide valid judgments on performance expectancy, effort expectancy, visual appeal, perceived engagement, and system satisfaction.

The study was conducted in accordance with the university's research ethics guidelines. Informed consent was obtained from all respondents, who were assured of anonymity and confidentiality. Participation was voluntary, and data were used solely for academic purposes. Data were collected via a self-administered online survey hosted on Google Forms from December 2023 to May 2025. A non-probability convenience sampling technique was adopted for its efficiency, cost-effectiveness, and ability to recruit a diverse pool of diners with minimal resource expenditure (Stratton, 2021).

Additionally, socioeconomic variation among respondents was taken into account during the recruitment process. To account for potential differences arising from socioeconomic status and dining contexts, the study incorporated respondents from diverse income levels and restaurant categories across Malaysia. The sample predominantly comprised individuals from lower to middle-income brackets, with a smaller representation of higher-income earners, reflecting prevailing consumption patterns within the Malaysian dining market. Participants reported dining experiences at low-cost casual eateries, mid-range family and chain restaurants, as well as upscale venues located in urban, suburban, and rural areas. The income level was collected as a key demographic indicator and served as a proxy for socioeconomic context, allowing the researchers to assess variations in perceptions of digital menu systems across different economic segments. By capturing income diversity alongside restaurant type and location, the study reduces socioeconomic bias and strengthens the external validity of the findings. This approach ensures that the observed relationships are not disproportionately driven by experiences limited to either economically disadvantaged or affluent dining environments.

The survey instrument was organized into three sequential sections to optimize data quality and relevance. First, a screening module confirmed that respondents had prior experience ordering via a digital menu system, preventing ineligible participants from proceeding. Next, measurement scales for all study constructs were drawn from established literature, with modifications made to meet the objectives and context of the current study (see Table 1), ensuring consistency with prior research and robust construct reliability. Finally, a demographic section captured participants' characteristics, enabling an assessment of sample diversity. The details of the respondents' profiles are presented in the following results section.

Table 1. The measurement items with sources

Construct	Total items	Source
Performance Expectancy (PE)	4	Adapted from Jeon et al. (2020) and Qi et al. (2021)
Effort Expectancy (EE)	4	Adapted from Alalwan (2020)
Visual Appeal (AV)	4	Adapted from Brewer and Sebby (2021)
Perceived Engagement (PENG)	4	Adapted from Yim and Yoo (2020)
Digital Menu System Satisfaction (SS)	5	Adapted from Dirsehan and Cankat (2021)
Restaurant Loyalty (BL)	4	Adapted from Dirsehan and Cankat (2021) and Na Nongkhai et al. (2024)

Meanwhile, the data analysis unfolded into two stages. Descriptive statistics and data-cleaning procedures were conducted in SPSS (version 30). Thereafter, SmartPLS (version 4.1.1.4) was used to evaluate the measurement model, assessing reliability and validity. Furthermore, SmartPLS was used to test the structural model, thereby thoroughly examining the hypothesized relationships among the key variables.

The final dataset included a total of 448 respondents. The respondents' demographic profiles were examined to assess sample representativeness. The gender distribution revealed nearly parity, with 50.2% identifying as male and 49.8% as female. The largest age cohort was 30 to 35 years old (31.7%), followed closely by those 18 to 23 years old (30.8%). Furthermore, one-fifth fell in the 24 to 29-year-old bracket (21.4%). In contrast, older groups were less represented, with approximately 36 to 41 years old (10.0%), 42 to 47 years old (3.1%), and 54 to 59 years old (1.1%). In terms of race, most respondents identified as Chinese (65.2%), followed by Malay (20.8%) and Indian (13.8%). Furthermore, a small number (0.2%) were reported as Bumiputra Sabah. In the meantime, respondents came across the Malaysian states, with the highest concentration in Penang (40.8%). Other notable origins include Selangor (5.6%), Perak (5.1%), and Kuala Lumpur (6.3%). The remaining states each contributed between 0.2% and 4.2%. Among the respondents, a majority held a bachelor's degree (85.3%). Smaller segments included diploma holders (6.5%), matriculation holders (4.5%), high school graduates (2.5%), and holders of doctoral degrees (1.3%). Meanwhile, the income distribution was skewed toward lower to middle brackets, with 43.8% earning less than RM20,000, 19.2% earning between RM36,000 and RM50,000, and 17.6% earning between RM51,000 and RM70,000. Another 10.9% fell in the RM20,000 to RM35,000 range. At the same time, 8.5% reported incomes above RM70,000, with 3.8% in the RM71,000 to RM100,000 range and less than 5% in higher bands.

3. RESULTS

The measurement model was assessed using several reliability and validity indicators, such as individual item loadings, Cronbach's alpha (α), Average Variance Extracted (AVE), and Composite Reliability (CR). The standard thresholds suggest acceptable values of ≥ 0.5 for AVE and ≥ 0.7 for CR. As detailed in Table 2, all AVE values exceeded the minimum benchmark of 0.5, while CR values were consistently above the 0.7 criterion. Meanwhile, the factor loadings demonstrated strong item reliability, with all loadings surpassing 0.7. Additionally, α coefficients were well above the 0.7 threshold, supporting adequate internal consistency. These results collectively affirm the convergent validity and reliability of the measurement model, aligning with the established guidelines proposed by Hair et al. (2021). Further, to address potential Common Method Bias (CMB) arising from single-source data collection, the study employed the full collinearity assessment approach recommended by Kock (2015). This procedure involves regressing all constructs against a common variable, with Variance Inflation Factor (VIF) values as the diagnostic criterion. A VIF ≤ 3.3 indicates the absence of substantial bias. The analysis yielded VIF values below this threshold, suggesting that CMB is unlikely to pose a concern in this study.

Besides, the study assessed discriminant validity using the Heterotrait-Monotrait Ratio (HTMT) (Franke & Sarstedt, 2018; Henseler et al., 2015). Under the criterion, HTMT values should not exceed 0.85 for a conservative assessment (or 0.90 for a more lenient threshold). As shown in Table 3, all interconstruct HTMT estimates fell below the

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Table 2. Construct reliability and validity

Construct	Item	VIF	Loading	α	CR (Rho_c)	AVE
Performance Expectancy	PE5. DMFO service shortens my overall meal duration at peak hours compared to restaurants without DMFO technology.	2.662	0.769	0.772	0.854	0.595
	PE6. DMFO service instantly confirmed my order without delay.		0.767			
	PE7. DMFO service saves my time.		0.829			
	PE9. DMFO service is well organized in terms of menu categorization.		0.717			
Effort Expectancy	EE1. Learning how to use the DFMO system is easy for me.	2.085	0.720	0.774	0.855	0.596
	EE2. My interaction with DMFO is clear and understandable.		0.786			
	EE3. I find the DFMO system easy to use.		0.802			
	EE4. I can easily become skillful at using the DFMO system.		0.778			
Visual Appeal	AV1. The way the menu is displayed is attractive.	2.427	0.803	0.815	0.878	0.643
	AV3. I like the look of the food menu.		0.789			
	AV4. I like the layout of the food menu.		0.768			
	AE5. I like the graphical display of the food menu.		0.846			
Perceived Engagement	PENG2. I had some control over the content of the DFMO system that I wanted to see.	2.334	0.712	0.720	0.827	0.544
	PENG3. The DFMO system could find my specific requests quickly.		0.749			
	PENG4. The DFMO system could find my specific requests efficiently.		0.775			
	PENG5. The DMFO system has features to customize my order.		0.713			
Digital Menu System Satisfaction	SS1. The last restaurant I ordered from using DMFO fulfilled my needs.	1.798	0.731	0.840	0.886	0.610
	SS2. The last restaurant I ordered from using DMFO fulfilled my expectations.		0.769			
	SS3. The last restaurant I ordered from using DMFO is of high quality.		0.814			
	SS4. I liked the last restaurant from which I ordered using DMFO.		0.815			
	SS5. Overall, I am satisfied with the last restaurant I ordered using DMFO.		0.774			
Restaurant Loyalty	BL1. I intend to continue making orders from the last restaurant I ordered.	2.913	0.738	0.790	0.864	0.613
	BL3. I will likely say positive things about restaurants that use DMFO to others.		0.805			
	BL4. I will likely recommend that others visit a restaurant that uses a DMFO for services.		0.799			
	BL5. I am likely to encourage others to visit a restaurant that uses a DMFO.		0.790			

Note: α = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted. DMFO = Digital Menu Food Ordering. PE = Performance Expectancy; EE = Effort Expectancy; AV = Visual Appeal; PENG = Perceived Engagement; SS = Digital Menu System Satisfaction; BL = Restaurant Loyalty.

stricter 0.85 cutoffs. This finding suggests that respondents perceived the six constructs as conceptually distinct, thereby reinforcing the measurement model's discriminant validity and overall reliability.

Consequently, multivariate normality was examined in accordance with the recommendations by Cain et al. (2016) and Hair et al. (2021). Mardia's tests for multivariate skewness ($\beta = 14.718$, $p < 0.01$) and kurtosis ($\beta = 90.772$, $p < 0.01$) indicated a significant exit from normality. Accordingly, and in line with Becker et al. (2023), a bootstrap procedure with 10,000 resamples was employed to estimate the structural model's path coefficients, standard errors, t-values, p-values, confidence intervals, and effect sizes (Ramayah et al., 2018). The approach aligns with best practices for handling

Table 3. Heterotrait-Monotrait Ratio (HTMT)

Construct	VA	EE	PENG	PE	BL	SS
Visual Appeal (AV)						
Effort Expectancy (EE)	0.747					
Perceived Engagement (PENG)	0.740	0.698				
Performance Expectancy (PE)	0.748	0.709	0.806			
Restaurant Loyalty (BL)	0.802	0.779	0.790	0.781		
Digital Menu System Satisfaction (SS)	0.629	0.675	0.604	0.681	0.653	

non-normal data in structural equation modeling.

Concerning the overreliance on p-values in hypothesis testing (Hahn & Ang, 2017), the study adopted a multi-faceted inferential framework by reporting p-values alongside 95% confidence intervals and effect size estimates. Confidence intervals highlight the precision and stability of parameter estimates, while effect sizes assess the practical significance beyond mere statistical significance. Effect sizes (f^2) were evaluated according to Chin (2010) benchmarks, with values of 0.02, 0.15, and 0.35 representing small, medium, and large effects, respectively.

Based on structural model analysis, Table 4 shows that performance expectancy, effort expectancy, visual appeal, and perceived engagement all have a positive effect on restaurant loyalty. Performance expectancy (*H1*) was positively related to restaurant loyalty ($\beta = 0.173$, $t = 2.865$, $p = 0.002$), with a small effect size ($f^2 = 0.034$), and effort expectancy (*H2*) also emerged as a significant predictor ($\beta = 0.208$, $t = 3.063$, $p = 0.001$; $f^2 = 0.054$). Visual appeal (*H3*) demonstrated the strongest influence among these factors ($\beta = 0.262$, $t = 4.423$, $p < 0.001$; $f^2 = 0.079$), while perceived engagement (*H4*) showed a similarly meaningful effect ($\beta = 0.189$, $t = 3.265$, $p = 0.001$; $f^2 = 0.054$). These constructs accounted for 57% of the variance in restaurant loyalty ($R^2 = 0.570$), thereby supporting hypotheses *H1* through *H4* with statistical and substantive significance. Besides, the bias-corrected 95% confidence intervals did not cross zero, further validating the robustness of the findings.

Furthermore, to evaluate predictive relevance, the study employed the PLSpredict procedure recommended by Shmueli et al. (2019), which utilize a holdout sample approach with a 10-fold cross-validation to generate case-level predictions at the item and construct levels. According to the guidelines, the model exhibits strong predictive power when prediction errors from the PLS model are consistently lower than those from a benchmark Linear Regression Model (LRM). As summarized in Table 5, all prediction errors derived from the PLS model were lower than those of the LM benchmark, indicating that the model demonstrated strong predictive capability.

As shown in Table 6, only the interaction between digital menu system satisfaction and visual appeal on restaurant loyalty was found significant (H5c: $\beta = 0.089$, $t = 1.730$, $p = 0.042$; CI [0.005, 0.172], $f2 = 0.016$). Hair et al. (2021) stated that f2 thresholds of 0.005, 0.01, and 0.025 denote weak, medium, and strong moderating effects, respectively. Thus, H5c exhibits a moderating effect. In contrast, H5a ($\beta = -0.047$, $t = 0.806$, $p = 0.210$; CI [-0.150, 0.044]), and H5b ($\beta = 0.021$, $t = 0.399$, $p = 0.345$; CI [-0.060, 0.114]) were non-significant, as does the H5d ($\beta = -0.076$, $t = 1.309$, $p = 0.095$; CI [-0.176, 0.016]) was found insignificant. H5a and H5b yielded negligible f2 values and confidence intervals that straddled zero, confirming that digital menu system satisfaction does not moderate the relationships between performance expectancy, effort expectancy, and restaurant loyalty. H5d likewise failed to produce a significant interaction, with its confidence interval crossing zero.

Table 4. Structural model analysis (direct relationship)

Relationship	Std. beta	Std. dev.	t-value	p-value	PCI LL	PCI UL	f^2	R^2
H1: PE → BL	0.173	0.060	2.865	0.002	0.074	0.273	0.034	0.570
H2: EE → BL	0.208	0.068	3.063	0.001	0.089	0.317	0.054	
H3: AV → BL	0.262	0.059	4.423	0.000	0.158	0.352	0.079	
H4: PENG → BL	0.189	0.058	3.265	0.001	0.095	0.287	0.054	

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Table 5. PLSpredict

MV	PLS–SEM_RMSE	LM_RMSE	PLS–LM_RMSE	Q^2_predict
BL1	0.710	0.738	–0.028	0.336
BL3	0.823	0.858	–0.035	0.347
BL4	0.820	0.870	–0.050	0.269
BL5	0.855	0.913	–0.058	0.351

Table 6. Moderation analysis

Relationship	Std. beta	Std. dev.	t-value	p-value	PCI LL	PCI UL	f^2
H5a: SS*PE → BL	–0.047	0.059	0.806	0.210	–0.150	0.044	0.004
H5b: SS*EE → BL	0.021	0.053	0.399	0.345	–0.060	0.114	0.001
H5c: SS*AV → BL	0.089	0.051	1.730	0.042	0.005	0.172	0.016
H5d: SS*PENG → BL	–0.076	0.058	1.309	0.095	–0.176	0.016	0.010

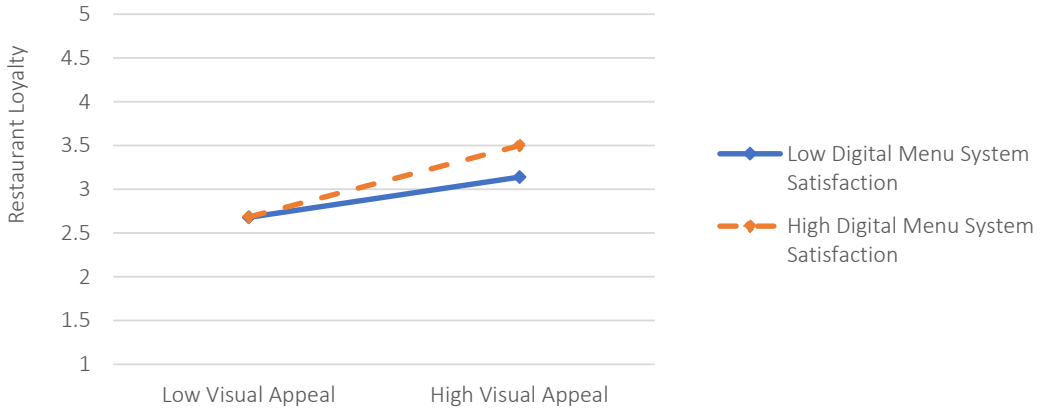

Figure 2. Interaction plot for H5c

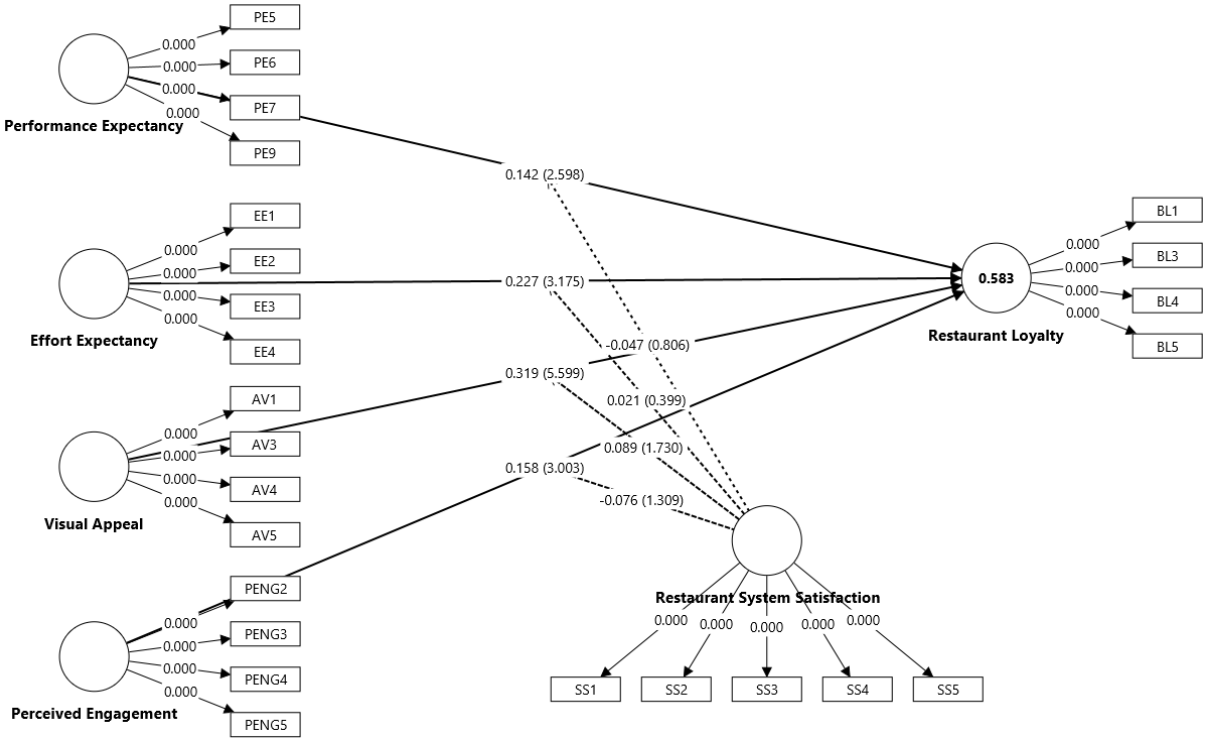

Figure 3. Structural model

4. DISCUSSION

The study examined the effects of performance expectancy, effort expectancy, visual appeal, and perceived engagement on restaurant loyalty. The findings showed that performance expectancy positively influenced restaurant loyalty. When diners believe that a digital menu system speeds up ordering, reduces errors, and enhances customization, they form stronger intentions to revisit and recommend the restaurant (Jeon et al., 2020; Qi et al., 2021). The finding aligned with UTAUT's emphasis on performance expectancy as a key driver of continued technology use (Venkatesh et al., 2012) and corroborated with studies that link perceived value to loyalty in the hospitality context (Indrawati, 2021; Yuen et al., 2023). It also echoes empirical work that ties system-level performance gains to greater satisfaction and repeat patronage in foodservice contexts (Jeon et al., 2020; Qi et al., 2021).

The results extend the literature by contextualizing performance expectancy within a Malaysian urban dining milieu and by testing it alongside visual appeal, effort expectancy, and perceived engagement in a single model. Contrasting some prior studies that treat performance expectancy in isolation, the current simultaneous estimation shows that performance expectations retain predictive power even when affective (visual appeal) and experiential (engagement) factors are present. This suggests that the practical, task-related benefits of digital menu systems continue to be a robust driver of loyalty, even as restaurants invest in aesthetics and interactive features.

Furthermore, the effort expectancy also emerged as a significant predictor of restaurant loyalty. Customers who perceive digital menu systems as easy to navigate, with minimal cognitive and physical effort, are more likely to show repeat patronage. This result aligns with UTAUT's proposition that perceived ease of use reduces adoption friction and supports continued usage (Venkatesh et al., 2003; Venkatesh et al., 2012). It corroborates studies in service-technology contexts, showing that streamlined interfaces increase satisfaction and repeat patronage by reducing cognitive load and transaction time (Beibei et al., 2025). Compared with studies that found null or weak effort effects in hedonic or novelty contexts, the urban dining sample likely prioritizes usability because the ordering process is a pragmatic, outcome-focused task. In this case, the situational demand helps explain why effort expectancy retained significance when tested alongside visual and engagement factors.

In the meantime, visual appeal has been demonstrated to have the strongest influence on restaurant loyalty. Digital menu systems characterized by vivid imagery, harmonious layouts, and appealing aesthetics enhance diners' satisfaction and foster a positive attitude (Rianmora et al., 2024). The finding is consistent with previous studies that have linked visual appeal to purchase intention, food desire, and loyalty (Arun et al., 2025; Brewer & Sebby, 2021; Gopal et al., 2024; Salisu et al., 2024). A visually attractive interface for a digital menu system captures attention, signals the quality and credibility of the food, and drives both behavioral and attitudinal loyalty. Unlike purely utilitarian predictors, visual appeal influences attention, perceived product quality, and trustworthiness. Those mechanisms translate directly into attitudinal endorsement and propensity to revisit. The robust visual appeal may reflect the combination of interactive digital displays and the prevalent social-media-driven food culture in the study setting, which magnifies the persuasive power of imagery relative to contexts where functional performance dominates.

Correspondingly, perceived engagement showed a similarly meaningful effect on restaurant loyalty. Digital menu systems that support personalized recommendations, interactive prompts, and real-time feedback foster users' psychological immersion and active participation (Lin et al., 2023), enhancing their emotional connection with the restaurant. Aligned with prior studies, the result showed that perceived engagement positively correlates with individual attitudes and behavioral intentions in a digital environment (Almusfar, 2025; Hoesch et al., 2025; Tanhaei et al., 2024). Comparatively, the findings extend the literature by showing that engagement functions not only as a precursor to drive purchase intentions but also as a mechanism that cultivates longer-term attachment to the restaurant, which evolves through affective commitment. The res-

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taurant's customers who feel a sense of belonging and involvement are more inclined to form long-term associations with the digital menu systems, thereby reinforcing loyalty toward the restaurant over time.

While the role of the digital menu system satisfaction as a moderator between performance expectancy, effort expectancy, visual appeal, and perceived engagement on restaurant loyalty showed that it only favorably moderates the association between visual appeal and loyalty. Contrary to prior studies that conceptualized satisfaction mainly as a mediator or direct predictor (Cahaya et al., 2023; Devi & Yasa, 2021), the finding highlights a conditional role. The digital menu system satisfaction appears to act as an amplifier for visual appeal more than for primarily utilitarian cues (performance and effort expectancies). When users are satisfied with the menu's basic functionality, aesthetic enhancements carry extra persuasive weight. Attractive imagery and polished layouts then function as confirmatory signals of quality, reinforcing favourable attitudes that translate into loyalty. By contrast, when satisfaction is low, even highly appealing visuals may be discounted because underlying functional problems undermine credibility.

Figure 2's slopes illustrate this interaction. The steep rise for high-satisfaction users indicates that investments in aesthetics yield disproportionately large loyalty returns among patrons who perceive the system as meeting their needs. Practically, this suggests a sequencing logic for improvements, where restaurants should first secure a baseline level of satisfaction through reliable performance and usability. Prioritizing baseline satisfaction before visual upgrades ensures aesthetic investments translate into stronger loyalty. Theoretically, these findings refine technology acceptance models in hospitality by demonstrating that affective cues and experiential satisfaction interact, rather than acting independently, to drive long-term patronage.

Equity theory explains satisfaction as a judgment about the fairness of inputs versus outputs in an exchange. Users feel satisfied when the rewards of an interaction at least match the effort they invest (Adams, 1965). Applied to digital menu systems, diners mentally trade cognitive inputs (time spent scanning, reading, and customizing orders) against hedonic and functional outputs (clarity, vivid imagery, enjoyment, and ordering accuracy). When visual appeal increases perceived outputs so that they meet or exceed inputs, users judge the exchange as fair and are more likely to translate that favourable evaluation into loyalty.

In the current study, the findings extend the prior literature by showing that satisfaction operates not only as an outcome of perceived fairness but also as a contextual amplifier. Where higher digital menu system satisfaction strengthens the effect of visual appeal on restaurant loyalty. This result aligns with studies that treat satisfaction as a moderator rather than a simple predictor (Ngirande, 2021; Nukhu & Singh, 2024; Ohunakin & Olugbade, 2022), clarifying why some prior work finds inconsistent relationships between aesthetics and behavioural outcomes. Visual cues are most important when baseline service quality and satisfaction have been established. Methodologically, unlike previous research work that examines visual appeal or satisfaction in isolation, the research model tests their interaction, demonstrating that aesthetic investments yield the most significant loyalty returns under conditions of confirmed functional performance and user satisfaction.

CONCLUSION

The current study examines how features of digital menu systems affect Malaysian consumers' loyalty to restaurants. The study incorporated core constructs of UTAUT2, specifically performance expectancy and effort expectancy, to elucidate how diners assess the value and usability of the digital menu system in developing a loyalty relationship with the restaurants. By integrating the performance expectancy, effort expectancy, visual appeal, and perceived engagement, the model explained a substantial part of loyalty emergence, highlighting the necessity of a dual-lens approach to technology acceptance in the restaurant industry. Additionally, the moderating effect of digital menu system satisfaction on visual

appeal and restaurant loyalty suggests that aesthetic features foster loyalty most effectively when diners are pleased with the digital menu systems. Furthermore, incorporating the digital menu system satisfaction as a moderator weaves an affective dimension into the model, showing how emotional responses interact with cognitive evaluations to shape the restaurant loyalty.

In terms of practical implications, the study provided insights for the restaurant industry to utilize the digital menu systems more effectively in cultivating restaurant loyalty. The restaurant practitioners should balance investment in high-quality visuals with robust system performance to achieve loyalty benefits. Meanwhile, it is essential to monitor continuous satisfaction with the digital menu system. For instance, this can be achieved through brief in-application prompts or post-order surveys, allowing managers to diagnose whether loyalty shortfalls stem from a shift from utilitarian to hedonic deficiencies in daily restaurant operations. Additionally, restaurant practitioners are encouraged to incorporate personalized features, such as dynamic menu recommendations. Restaurant practitioners should also tailor communications to the level of diners' satisfaction. For delighted customers, implement visual updates that showcase new dishes or customized experiences. For less satisfied customers, emphasize reliability improvements or offer targeted incentives to improve their satisfaction. This multifaceted approach can recalibrate equity perceptions and foster enduring restaurant loyalty.

Despite providing valuable insights into performance expectancy, effort expectancy, visual appeal, and perceived engagement, with the moderating role of digital menu system satisfaction that drives restaurant loyalty, this study has some limitations. The current study relies on a convenience sample from Malaysia, and its cross-sectional design may limit the generalizability and causal inference. Moreover, the study focuses on selected key variables, such as performance expectancy and effort expectancy from UTAUT, and tests only digital menu system satisfaction as a moderator, omitting factors like facilitating condition, trust, and other potential mediators. Future studies could employ random or stratified sampling across diverse cultural and geographical contexts, adopt longitudinal or experimental designs to establish causality, and integrate additional theoretical constructs, mediators, and moderators to provide a more comprehensive understanding of the impact of digital menu systems on restaurant loyalty.

In conclusion, the study found that performance expectancy, effort expectancy, visual appeal, and perceived engagement are significant positive predictors of restaurant loyalty among Malaysian consumers. Moreover, digital menu system satisfaction moderates this relationship, strengthening the effect of visual appeal on restaurant loyalty. These results suggest that restaurateurs should prioritize usability, visually appealing interface design, and engaging features in digital menu systems to foster customer loyalty effectively. Practically, restaurants should balance reliable, user-friendly menu functionality with high-quality, personalized visuals, and monitor digital menu satisfaction to guide resource allocation between technical performance and design. The current research model can be extended to other cultures and dining formats, and tested with longitudinal or experimental designs to strengthen causal inference and track the evolution of digital dining experiences.

AUTHOR CONTRIBUTIONS

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REFERENCES

1. Adams, J. S. (1965). Inequity In Social Exchange. *Advances in Experimental Social Psychology, 2,* 267-299. https://doi.org/10.1016/S0065-2601(08)60108-2
2. Alalwan, A. A. (2020). Mobile food ordering apps: An empirical study of the factors affecting customer e-satisfaction and continued intention to reuse. *International Journal of Information Management, 50,* 28-44. https://doi.org/10.1016/j.ijinfomgt.2019.04.008
3. Alfehaid, M. M., Hasan, T. H., Alfisal, A. A., Saleh, M. I., Bumbak, S. V., & Helal, M. Y. (2024). Post-pandemic digital transformation: Mitigating technostress and increasing well-being in the hospitality industry via the person-technology fit model. *Geo Journal of Tourism and Geosites, 53*(2), 388-399. https://doi.org/10.30892/gtg.53202-1214
4. Almusfar, L. A. (2025). Improving learning management system performance: A comprehensive approach to engagement, trust, and adaptive learning. *IEEE Access, 13,* 46408-46425. Retrieved from https://ieeexplore.ieee.org/document/10921636
5. Anggraeni, E., Normasyhuri, K., & Kurniawan, M. (2024). Continuity intention segment mobile payments: Review the immediate effects of performance expectancy and effort expectancy. *KnE Social Sciences, 9*(16), 499-524. https://doi.org/10.18502/kss.v9i16.16266
6. Arun, A., Karthikeyan, B., & Moyeenudin, H. M. (2025). The influence of food presentation and photography on restaurant sales and customer preferences. *International Journal of Innovative Research in Technology, 11*(12), 3766-3771. Retrieved from https://ijirt.org/article?manuscript=178110
7. Ayad, T., & Hasanein, A. (2024). The mediating role of customer satisfaction on the relationship between e-menus and customers behavioral intentions in the quick service restaurants. *Advances in Hospitality and Tourism Research, 12*(4), 368-390. https://doi.org/10.30519/ahtr.1404613
8. Baron, R., & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173-1182. https://doi.org/10.1037//0022-3514.51.6.1173
9. Bawazir, A., Kamal, A., Lean, G., Lee, L., Ng, S. K., Mohamad Nor, S., & Noordin, P. (2023). Factors affecting consumer acceptance of e-menu in the Klang Valley restaurant sector in Malaysia. *International Journal of Academic Research in Business and Social Sciences, 13*(6), 844-861. https://doi.org/10.6007/IJARBSS/v13-i6/17108
10. Becker, J.-M., Cheah, J.-H., Gholamzade, R., Ringle, C. M., & Sarstedt, M. (2023). PLS-SEM's most wanted guidance. *International Journal of Contemporary Hospitality Management, 35*(1), 321-346. https://doi.org/10.1108/IJCHM-04-2022-0474
11. Beibei, L., Rungruang, P., & Navavongsathian, A. (2025). The factors of behavioral intention affecting user loyalty on knowledge payment platforms in China. *Journal of Educational Innovation and Research, 9*(1), 56-74. Retrieved from https://so03.tci-thaijo.org/index.php/jeir/article/view/281306
12. Brewer, P., & Sebby, A. G. (2021). The effect of online restaurant menus on consumers' purchase intentions during the COVID-19 pandemic. *International Journal of Hospitality Management, 94,* 102777. https://doi.org/10.1016/j.ijhm.2020.102777
13. Cahaya, Y. F., Siswanti, I., Putra, Y. M., & Pattiwael, A. C. (2023). Contributions to customer satisfaction from product quality, promotion and price. *Journal of Economics, Finance and Management Studies, 6*(6), 2434-2440. https://doi.org/10.47191/JEFMS/V6-I6-02
14. Cain, M., Zhang, Z., & Yuan, K.-H. (2016). Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation. *Behavior Research Methods, 17,* 1716-1735. https://doi.org/10.3758/s13428-016-0814-1
15. Chang, H. H., Yao-Hua, W., & Yang, W.-Y. (2009). The impact of e-service quality, customer satisfaction and loyalty on e-marketing: Moderating effect of perceived value. *Total Quality Management & Business Excellence, 20*(4), 423-443. https://doi.org/10.1080/14783360902781923
16. Chin, W. W. (2010). How to write up and report PLS analyses. In V. Esposito Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 655-690). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-540-32827-8_29
17. Cudjoe, D., Zhang, H., & Wang, H. (2023). Predicting residents' adoption intention for smart waste classification and collection system. *Technology in Society, 75,* 102381. https://doi.org/10.1016/j.techsoc.2023.102381
18. Devi, A., & Yasa, N. (2021). The role of customer satisfaction in mediating the influence of service

quality and perceived value on brand loyalty. *International Research Journal of Management, IT and Social Sciences, 8*(3), 315-328. https://doi.org/10.21744/irjmis.v8n3.1786

19. Dirsehan, T., & Cankat, E. (2021). Role of mobile food-ordering applications in developing restaurants' brand satisfaction and loyalty in the pandemic period. *Journal of Retailing and Consumer Services, 62,* 102608. https://doi.org/10.1016/j.jretconser.2021.102608

20. Fan, A., & Mattila, A. S. (2020). Touch versus tech in service encounters. *Cornell Hospitality Quarterly, 62*(4), 468-481. https://doi.org/10.1177/1938965520957282

21. Franke, G., & Sarstedt, M. (2018). Heuristics versus statistics in discriminant validity testing: A comparison of four procedures. *Internet Research, 29*(3), 1-31. https://doi.org/10.1108/IntR-12-2017-0515

22. Gitnux. (2025). *Digital transformation in the restaurant industry statistics*. Retrieved from https://gitnux.org/digital-transformation-in-the-restaurant-industry-statistics/

23. Gopal, S., Gil, M. T., Cydel Salian, B., & Baddaoui, J. (2024). Optimizing digital menus for enhanced purchase intentions: Insights from India's restaurant industry in the post-COVID-19 era. *Cogent Business & Management, 11*(1), 2432536. https://doi.org/10.1080/23311975.2024.2432536

24. Hafizh, M. D., Suroso, A. I., & Ratono, J. (2024). Factors affecting continuance intention towards adoption of LinkAja mobile payment. *Jurnal Aplikasi Manajemen dan Bisnis [Journal of Management and Business Applications], 10*(3), 768-779. https://doi.org/10.17358/jabm.10.3.768

25. Hahn, E., & Ang, S. (2017). From the editors: New directions in the reporting of statistical results in the Journal of World Business. *Journal of World Business, 52*(2), 125-126. https://doi.org/10.1016/j.jwb.2016.12.003

26. Hair, J. F., Thomas, G., Hult, M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling* (3rd ed.). Sage. Retrieved from https://uk.sagepub.com/en-gb/eur/a-primer-on-partial-least-squares-structural-equation-modeling-pls-sem/book270548

27. Hassan, S. H., & Low, E. C. (2024). The impact of food-related user-generated content (UGC) characteristics on user engagement dynamics and behavioral outcomes. *Library Progress International, 44*(3), 8709-8724. Retrieved from https://bpasjournals.com/library-science/index.php/journal/article/view/2012

28. Hayati, E., & Salim, M. (2025). Scroll, click, checkout: Does visual appeal take women's attention to buy impulsively? *Journal of Enterprise and Development, 7,* 232-243. https://doi.org/10.20414/jed.v7i2.13159

29. Henseler, J., Ringle, C., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43,* 115-135. https://doi.org/10.1007/s11747-014-0403-8

30. Hoesch, K. W., Mills, S. B., Rand, J., Nilson, R., Bessette, D. L., White, J., & Hoen, B. (2025). What to expect when you're expecting engagement: Delivering procedural justice in large-scale solar energy deployment. *Energy Research and Social Science, 120,* 103893. https://doi.org/10.1016/j.erss.2024.103893

31. Indrawati, L. (2021). Customer loyalty of using digital payment during the covid-19 pandemic in Indonesia. *Selangor Business Review, 6*(2), 1-16. https://sbr.journals.unisel.edu.my/index.php/sbr/article/view/98

32. Jeon, H. M., Sung, H. J., & Kim, H. Y. (2020). Customers' acceptance intention of self-service technology of restaurant industry: Expanding UTAUT with perceived risk and innovativeness. *Service Business, 14*(3), 533-551. https://doi.org/10.1007/s11628-020-00425-6

33. Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration, 11*(4), 1-10. https://doi.org/10.4018/ijec.2015100101

34. Lee, J., & Lim, H. (2023). Visual aesthetics and multisensory engagement in online food delivery services. *International Journal of Retail and Distribution Management, 51*(8), 975-990. https://doi.org/10.1108/IJRDM-09-2021-0451

35. Lee, M., Ahn, J., Shin, M., Kwon, W., & Back, K.-J. (2021). Integrating technology to service innovation. *Journal of Hospitality and Tourism Technology, 12*(1), 19-38. https://doi.org/10.1108/JHTT-01-2019-0013

36. Leong, T. K., Chiek, A. N., Meng, T. P., & Eng, T. K. (2023). Customers loyalty in Malaysian retail bank sector from the perspective of equity theory and expectation-confirmation model: A PLS-SEM and NCA approach. *Journal of Business and Social Review in Emerging Economies, 9*(3), 245-262. https://doi.org/10.26710/jbsee.v9i3.2605

37. Leung, X. Y., Torres, B., & Fan, A. (2021). Do kiosks outperform cashiers? An S-O-R framework of restaurant ordering experiences. *Journal of Hospitality and Tourism Technology, 12*(3), 580-592. https://doi.org/10.1108/JHTT-03-2020-0065

38. Lin, P. M. C., Peng, K.-L., Au, W. C. W., Qiu, H., & Deng, C. D. (2023). Digital menus innovation diffusion and transformation process of consumer behavior. *Journal of Hospitality and Tourism Technology, 14*(5), 732-761. https://doi.org/10.1108/JHTT-07-2021-0217

39. Liu, C.-H., Chou, S.-F., & Lin, J.-Y. (2025). Critical criteria for restaurant technology application: the interrelationship effect of influencing technology acceptance and brand equity. *Journal of Marketing Analytics*. https://doi.org/10.1057/s41270-025-00375-w

40. Low, E. C., & Hassan, S. H. (2024). *Exploring the food-related user-generated content and the relevant impact on user engagement behav-*

http://dx.doi.org/10.21511/im.22(1).2026.09

iour. Proceedings of the 2nd International Conference on Accounting and Business (ICAB2024), Perak, Malaysia. Retrieved from https://www.researchgate.net/profile/Syed-Syed-Musa-2/publication/384688351_e-PROSIDINGs_ICAB_2024_LATEST_13_SEPT/links/6703ada8f599e0392fc0be2a/e-PROSIDINGs-ICAB-2024-LATEST-13-SEPT.pdf#page=9

41. Mohamed, H. E., Hasanein, A. M., & Saad, S. G. (2022). The impact of digital menus on customer behavioral intentions in casual dining restaurants: Mediating role of customer satisfaction. *International Academic Journal Faculty of Tourism and Hotel Management, 8*(2), 49-73. https://doi.org/10.21608/ijaf.2022.302807

42. Na Nongkhai, J., Chompoonut, S., & and Mahasuweerachai, P. (2024). Why young consumers engage with mobile self-ordering applications (MFOAs) at restaurants during COVID-19: The role of functional and psychological factors. *Journal of International Food and Agribusiness Marketing, 36*(5), 1008-1032. https://doi.org/10.1080/08974438.2023.2255573

43. Ngirande, H. (2021). Occupational stress, uncertainty and organisational commitment in higher education: Job satisfaction as a moderator. *SA Journal of Human Resource Management, 19*(2), 1-11. https://doi.org/10.4102/sajhrm.v19i0.1376

44. Noorkhizan, M. H. I., Samsudin, A., Anuar, J., Zain, R. A., & Adzmy, A. (2023). Examining customer satisfaction on electronic tablet based menu in restaurants. *International Journal of Business and Technology Management, 5*(S1), 108-115. https://doi.org/10.55057/ijbtm.2023.5.S1.10

45. Nukhu, R., & Singh, S. (2024). Is satisfaction a moderator? The effect of sensory experience on perceived environmental sustainability and WOM: A study on the world's first organic state – Sikkim, India. *Journal of Hospitality and Tourism Insights, 7*(1), 479-499. https://doi.org/10.1108/JHTI-09-2022-0461

46. Ohunakin, F., & Olugbade, O. A. (2022). Do employees' perceived compensation system influence turnover intentions and job performance? The role of communication satisfaction as a moderator. *Tourism Management Perspectives, 42,* 100970. https://doi.org/10.1016/j.tmp.2022.100970

47. Qi, Q., Tao, F., Hu, T., Anwer, N., Liu, A., Wei, Y., Wang, L., & Nee, A. Y. C. (2021). Enabling technologies and tools for digital twin. *Journal of Manufacturing Systems, 58B,* 3-21. https://doi.org/10.1016/j.jmsy.2019.10.001

48. Rachmad, Y. E., Bakri, A. A., Nuraini, R., Nurdiani, T. W., & Kushariyadi5. (2024). Application of the unified theory of acceptance and use of technology method to analyze factors influencing the use of digital wallets in Indonesia. *Jurnal Informasi dan Teknologi [Journal of Information and Technology], 6*(1), 229-234. https://doi.org/10.60083/jidt.v6i1.504

49. Ramayah, T., Hwa, C., Chuah, F., Ting, H., & Memon, M. (2018). *Partial least squares structural equation modeling (pls-sem) using smartpls 3.0: An updated and practical guide to statistical analysis* (2nd ed.). Pearson. Retrieved from https://www.researchgate.net/publication/312460772_Partial_Least_Squares_Structural_Equation_Modeling_PLS-SEM_using_SmartPLS_30_An_Updated_and_Practical_Guide_to_Statistical_Analysis

50. Rianmora, S., Sukjitsakunchai, L., & Tachawatanawisal, T. (2024). Designing and developing a platform called 'rest at restaurant' to support the basic needs of senior adults. *Cogent Business and Management, 11*(1), 2301798. https://doi.org/10.1080/23311975.2024.2301798

51. Sadanala, G., Xu, X., He, H., Bueno-Vesga, J., & Li, S. (2025). Enhancing distance learning with virtual reality: Investigating learners' engagement and outcomes. *Distance Education, 46*(2), 225-252. https://doi.org/10.1080/01587919.2024.2351929

52. Sahin, E. (2020). An evaluation of digital menu types and their advantages. *Journal of Tourism and Gastronomy Studies, 8*(4), 2374-2386. https://doi.org/10.21325/jotags.2020.716

53. Salisu, B., Gasamu, S., & Kachalla, B. (2024). Student perceptions of visual design in fast-food packaging: Insights for optimising marketing strategies. *Journal of Social, Management and Tourism Letter, 11,* 1-11. Retrieved from https://jms.procedia.org/archive/JSMTL_254/procedia_2024_2024_jsmtl-2408112112902.pdf

54. Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J.-H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. *European Journal of Marketing, 53*(11), 2322-2347. https://doi.org/10.1108/EJM-02-2019-0189

55. Statista. (2025). *Food services in China - statistics & facts*. Retrieved from https://www.statista.com/topics/5301/catering-industry-in-china/#topicOverview

56. Stratton, S. J. (2021). Population research: Convenience sampling strategies. *Prehospital and Disaster Medicine, 36*(4), 373-374. https://doi.org/10.1017/S1049023X21000649

57. Susanto, K. C., Prasetyo, Y. T., Cahigas, M. M. L., Nadlifatin, R., Persada, S. F., & Ayuwati, I. D. (2024). *Determining factors affecting customer loyalty and satisfaction in online food delivery service during the covid - 19 pandemic: A UTAUT2 approach*. 2024 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM), Bangkok, Thailand. Retrieved from https://ieeexplore.ieee.org/document/10857260

58. Taghizadeh, H., Panahi, K., & Iranzadeh, S. (2021). The impact of personalization on customers' loyalty and the intention to use e-banking services. *International Economics Studies, 51*(2), 37-52. https://doi.org/10.22108/ies.2022.132161.1125

59. Tanhaei, H., Boozary, P., & Sheykhan, S. (2024). Analyzing the impact of social media marketing, word of mouth and price

perception on customer behavioral intentions through perceived interaction. *International Journal of Business and Social Science, 15*(1), 69-77. Retrieved from https://ijbss.thebrpi.org/journals/Vol_15_2024/8.pdf

60. Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478. https://doi.org/10.2307/30036540

61. Venkatesh, V., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36*(1), 157-178. https://doi.org/10.2307/41410412

62. Verdania Latif, D. (2021). The effect of gender in the implementation of self ordering machine in a fast food restaurant. *Turkish Journal of Computer and Mathematics Education, 12*(11), 1292-1396. https://doi.org/10.17762/turcomat.v12i11.6051

63. Walster, E., Berscheid, E., & Walster, G. (1973). New directions in equity research. *Journal of Personality and Social Psychology, 25*(2), 151-176. https://doi.org/10.1037/h0033967

64. WifiTalents. (2025). *Restaurant industry statistics*. Retrieved from https://wifitalents.com/restaurant-industry-statistics/

65. Wijemanna, W. W., & Sachithra, V. (2024). Antecedents of continuance usage of omnichannel retailling: Refer to younger generation in Sri Lanka *Journal of Business Research and Insights, 10*(2), 13-27. https://doi.org/10.31357/jbri.v10i02.7959

66. Yim, M. Y.-C., & Yoo, C. Y. (2020). Are digital menus really better than traditional menus? The mediating role of consumption visions and menu enjoyment. *Journal of Interactive Marketing, 50*(1), 65-80. https://doi.org/10.1016/j.intmar.2020.01.001

67. Yoganathan, V., Osburg, V.-S., Kunz, W. H., & Toporowski, W. (2021). Check-in at the robo-desk: Effects of automated social presence on social cognition and service implications. *Tourism Management, 85,* 1-148. https://doi.org/10.1016/j.tourman.2021.104309

68. Yuen, K. F., Koh, L. Y., Wong, Y. Q., & Wang, X. (2023). Sustainable crowdsourced delivery: A study of technological, health, value, and trust antecedents of consumer loyalty. *Journal of Cleaner Production, 405,* 137010. https://doi.org/10.1016/j.jclepro.2023.137010

69. Yuliantie, E. (2024). The effect of performance expectancy on behavioral intention: The mediating role of satisfaction. *Journal of Management and Business Insight, 2*(1), 80-89. https://doi.org/10.12928/jombi.v2i1.1123

http://dx.doi.org/10.21511/im.22(1).2026.09