CONSUMER PERCEPTION AND SATISFACTION OF QUICK RESPONSE (QR) CODE IN CASUAL DINING RESTAURANTS IN MALAYSIA

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Abstract. This study explores the impact of QR code technology on customer perception and satisfaction in casual dining restaurants in Malaysia. Despite its benefits in menu viewing, ordering, and payment processes, QR codes face negative perceptions due to technological anxiety, security concerns, and lack of personal service. The research aims to: (1) determine customer perceptions towards QR codes, (2) measure satisfaction levels, and (3) investigate socio-demographic differences in QR code adoption. Using a quantitative cross-sectional design, data were collected from 379 respondents via social media and communication platforms. Analyses revealed that QR codes are predominantly used during lunch time, and the most selected frequency of dining out was 1-3 times per week. Key predictors of consumer perception and satisfaction include pleasure, personal service, ease of use, and security. Significant differences were found across age, ethnicity, education level, and employment status. These findings provide valuable insights for restaurateurs to enhance QR code adoption and improve self-service technology to meet consumer needs in casual dining settings.
Keywords: *SST, Quick Response code, casual restaurants, dining out, perception, satisfaction*

Introduction

Prior to the use of technology in restaurants, customers' orders were taken manually using pen and paper by the restaurants' employees; which were prone to human errors, paper wastage, and required more manpower. The food industries began utilizing self-service technologies (SSTs) to improve restaurants' service process in terms of productivity, skills and values; and these technologies have allowed customers to experience the services without having the interference of restaurants' employees (Shahid Iqbal et al., 2018). SSTs adoption in restaurants can cut on the customers' waiting time and reduce the labor cost which resulted in better management performance and improved customers' dining experience (Shim et al., 2020). In the food service industry, technological presence in restaurants includes innovative service experiences such as robots (Xu et al., 2020), self-service kiosks in fast food restaurants (Ishak et al., 2021), adoption of tableside tablets (Baiomy, 2021) and quick response code (QR code) (Intal et al., 2020). Restaurants that have adopted consumer-oriented SSTs, have increased guest empowerment in the service delivery process (Nilsson et al., 2021). The Covid-19 pandemic has accelerated the adoption of digital technologies in the F&B industry; people around the world have adopted the new norms of social distance and other safety measures such as contactless experiences and transactions which have accelerated technology usage (De' et al., 2020). During the pandemic, the quickest solution for some businesses to ensure social distancing and contactless service was to provide a PDF menu that can be accessed using a QR code; which can also be used for online ordering and payment. QR code is fast and easy to use as users only

need to scan the code using their smart phone and it will directly link to the desired page (Winter, 2011); thus, fulfilling the contactless service requirement.

Despite the convenience and efficiency that QR code technology provides, some consumers may be hesitant to use it due to a lack of familiarity or understanding of how to use the technology (Nguyen and Alang, 2024; Ozkaya et al., 2015). In fact, older adults reported lower awareness, knowledge and usage of QR codes compared to younger and middle-age adults (Mendelson and Romano Bergstrom, 2013). Furthermore, for older people in contrast to younger participants, they experience less effectiveness, comfort and control with technology. Their ability to use technology was hindered by cognitive deficiencies and low self-efficacy related to aging (Vaportzis et al., 2017). Other than that, previous research has shown that trust is a key factor in predicting consumer acceptance of new technology (Wu et al., 2011). Consumers may be doubtful to use QR codes if they do not trust the technology or the restaurant's implementation of the technology. For example, consumers perceive security risk on online financial transactions such as the payment and banking information (Johnson et al., 2020). QR codes in restaurants have become increasingly popular due to the convenience they offer both customers and restaurant owners. According to a study by the NRA (2024), 59% and 48% of full-service customers say they would use a QR code to view a menu; and order food respectively; however, only 30% and 24% of baby boomers (aged 60-78 years), would do the same respectively. While these technologies can enhance efficiency and convenience, they also shift the nature of personal interactions between customers and staff. According to Nilsson et al. (2021) there are customers that prefer to have more staff interaction as they feel that they lack personal service. Consequently, they also feel that the menu is overpriced as less staff service is used, hence a lower price for the menu should be offered. The absence of direct interaction with staff can make diners feel neglected or less valued. Due to mixed findings of positive and negative experiences on QR code usage in existing literature, this study aimed to explore customers' perception of QR code in casual dining restaurants, measure their satisfaction level with QR code usage, and investigate if socio-demographic factors influence the adoption of QR code. The conceptual framework (*Figure 1*) used in this study was adapted from the conceptual models developed by Nilsson et al. (2021) and Johnson et al. (2020). Six independent variables: usability, personal service, pleasure, technological readiness, ease of use, and security; were utilized to measure consumers' perceptions and satisfaction with using QR codes for ordering and/or paying in casual dining restaurants. The findings of this study can help restaurants gain a better understanding about casual dining consumers' perception and satisfaction with using QR codes for ordering and/or paying purposes. Additionally, this research may provide valuable information to managers responsible for designing and implementing QR codes in their restaurants to enhance customer experiences and operational efficiencies that ultimately lead to greater success in a highly competitive casual dining market.

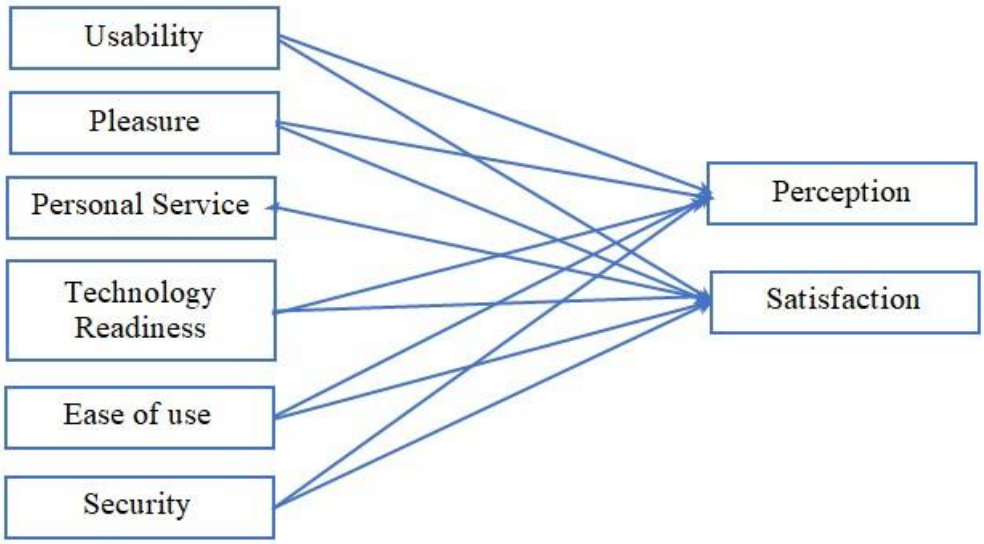

Figure 1. *Conceptual framework.*

Materials and Methods

A quantitative cross-sectional research design using self-administered questionnaire was used to collect data using Google form and distributed through social media and communication platforms; Instagram, WhatsApp, Telegram, and email. Data were collected through purposive sampling of customers that have experienced QR codes for ordering and/or paying in casual dining restaurants. The questionnaire included three sections; (A) Demographics Data, (B) Independent Variables (usability, pleasure, personal service, technology readiness, ease of use, security), (C) Dependent Variables (perception, satisfaction). Questions were adapted from previously published studies (Na et al., 2021; Giovanis et al., 2019; Hyppönen et al., 2019; Daud et al., 2018; Karim et al., 2016; Guo et al., 2012; White et al., 2012; Liu and Jang, 2009; Ramayah and Ignatius, 2005; Parasuraman, 2000). The responses were measured using 5-point Likert Scale that offers five options for responses to a statement or question, allowing respondents to express their level of agreement or disapproval with the statement or question on a negative-to-positive scale 1-5 respectively: for example, 1: Strongly disagree, and 5: Strongly agree (Taherdoost, 2019).

Results and Discussion

A total of 379 responses were collected online from respondents throughout Malaysia covering all fourteen states in East and West of Malaysia. Data were analyzed using IBM SPSS Statistics (Version 27) for reliability analysis, descriptive analysis, correlation, regression analysis, and mean comparisons using t-test and ANOVA. Prior to the data collection, a pilot test was conducted among 30 respondents of equal numbers corresponding to the three different age groups of adults (18-35 years old), middle-aged adults (36-55 years old) and elderly (55 and above years old) to test the reliability of the questionnaires. All variables demonstrated high reliability, with Cronbach's alpha values exceeding 0.70, as shown in *Table 1*.

Table 1. *Reliability analysis of variables.*

Variables	Cronbach's Alpha	N of items
Usability	.961	4
Pleasure	.920	4
Personal Service	.834	3
Technological Readiness	.888	4
Ease of Use	.929	4
Security	.974	4
Perception	.965	4
Satisfaction	.976	4

Respondents' demographic profile

Table 2 provides the demographic profile of the respondents. Most of the respondents were female with the percentage of 55.9%. The respondents were mostly between 18-35 years old (44.6%), followed by the middle-aged adult group (36-54 years old) at 31.4% and the elderly (55 years and above) at 24.0%. The majority of the respondents were Bumiputera Sabah (28.8%), followed by Indian, Malay, and Chinese with 22.7%, 21.4%, and 14.5% respectively. This composition differs from Malaysia's overall population, which consists of Malay (52.3%) followed by Chinese (20.1%), Bumiputera (11%), and Indian (5.9%) (DOSM, 2024). Most of the respondents have a bachelor's degree (42.2%) followed by diploma (28%), additionally the majority of the respondents have a monthly income of <RM3680 (59.9%).

Table 2. *Demographic profile.*

Category	Frequency (N)	Percentage (%)
Gender		
Male	167	44.1
Female	212	55.9
Age		
18-35 years	169	44.6
36-54 years	119	31.4
≥55 years	91	24.0
Ethnicity		
Chinese	55	14.5
Indian	86	22.7
Malay	81	21.4
Orang Asli	12	3.2
Bumiputera Sabah	109	28.8
Bumiputera Sarawak	36	9.5
Place of Residence		
Johor	23	6.1
Kedah	19	5.0
Kelantan	20	5.3
Malacca	26	6.9
Negeri Sembilan	14	3.7
Pahang	21	5.5
Perlis	27	7.1
Perak	25	6.6
Penang	24	6.3
Sabah	35	9.2
Sarawak	24	6.3

Selangor	21	5.5
Terengganu	26	6.9
Wilayah Persekutuan Kuala Lumpur	30	5.9
Wilayah Persekutuan Labuan	24	6.3
Wilayah Persekutuan Putrajaya	20	5.3
Education		
High School	75	19.8
Diploma	106	28.0
Bachelor's Degree	160	42.2
Postgraduate Degree	38	10.0
Monthly Household Income		
<RM3860	227	59.9
RM3860 - RM8319	98	25.9
>RM8319	54	14.2

QR code usage, type of meals consumed and dining companion when dining out

Figure 2 shows the frequency of QR code usage in casual dining restaurants for ordering and/or paying in a week. Most of the respondents revealed that they utilized QR code 1-3 times per week (69.4%), followed by 7 or more times per week (15.6%), and by 4-6 times per week (15.0%). This implies that some of the respondents dine out on a daily basis. According to Hakim (2025) 19% of Malaysians dine out every day, while nearly half of Malaysians dine out multiple times per week. Additionally, Azlan et al. (2024) conducted a study in Johor found that 11.1% of respondents in their study visited a casual dining restaurant daily, while 23.1% of respondents visited 1-2 times per week. Furthermore, in a study conducted among 100 adults between the ages of 30-70, found that 84% eat-out (for at least one meal over two or three days) (Lydiatul Shima et al., 2022). *Figure 3* presents the frequency for types of meals consumed at casual dining restaurants. Most respondents reported frequently eating lunch at casual dining restaurants (76.5%), followed by dinner, breakfast, and supper with 70.4%, 29.3%, and 17.7% respectively. This is in line with the findings in the UK whereby in spite of dining out practices, the home meal especially for dinner is still practiced in particular among respondents with children (Ray, 2021). As dining out is often a socialization activity, the majority of the respondents reported dining out with family and friends with 39% and 38% respectively; 8% dined out with colleagues. Despite this, 15% of the respondents reported dining out alone as shown in *Figure 4*. This is in contrast to the idea that people dine out for conviviality, variety, and relief from work (Ray, 2021). In Malaysia, 73% reported eating out with family (Hakim 2025; Lawrence, 2023).

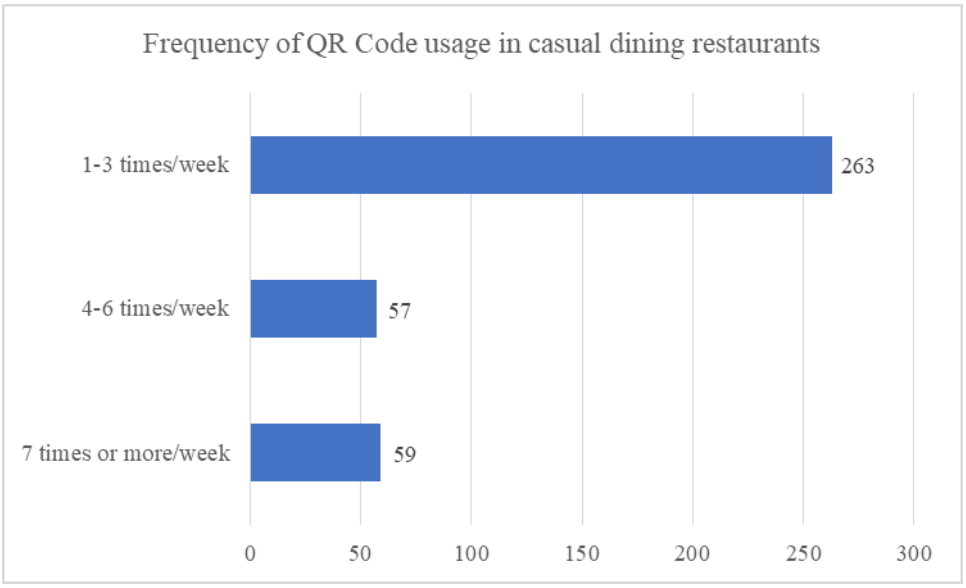

Figure 2. *QR code usage for ordering and/or paying per week.*

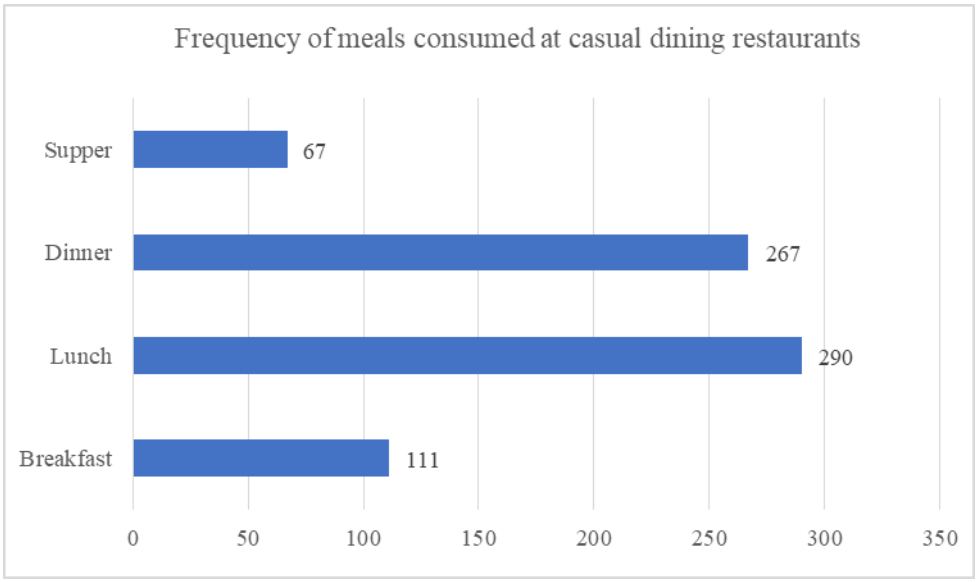

Figure 3. *Types of meal consumed at casual dining restaurants.*

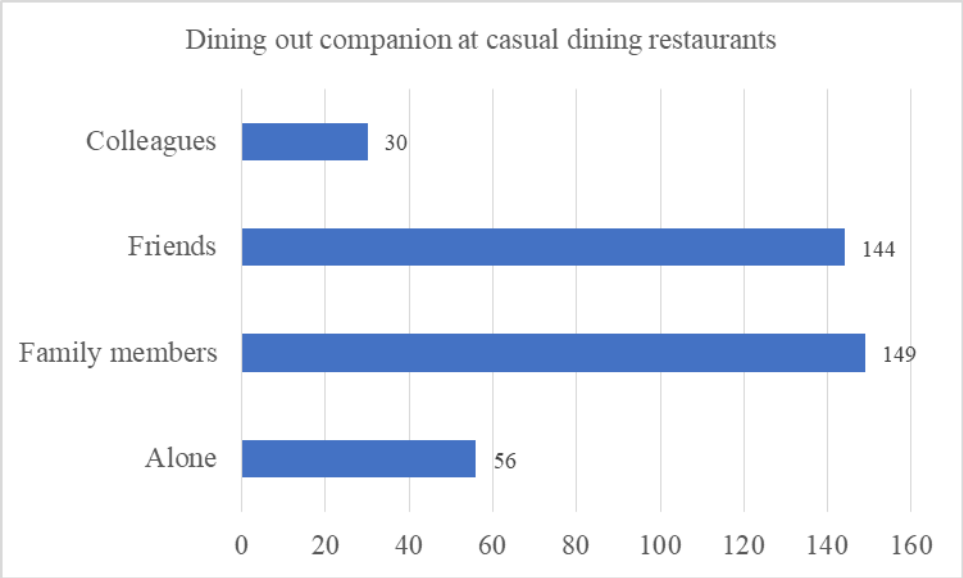

Figure 4. *Dining companion at casual dining restaurants.*

Mean, standard deviation and correlation of variables

Table 3 provides the mean, standard deviation and correlation of the variables in this study. All variables, both independent and dependent variables had mean values ranging between 3.399 and 3.864. All the independent variables had significant moderate to strong positive correlations with perception and satisfaction, with the exception of personal service which had negative correlations, indicating that there is a negative relationship between personal service with customers' perception and satisfaction. Consumers may perceive a decrease in personalized service when interacting with digital interfaces rather than human staff. The absence of face-to-face interaction can lead to a feeling that the service is less personal or attentive, potentially leading to a negative impact on overall customer perceptions and satisfaction, especially in dining establishments where personal service is highly valued. Perhaps the respondents considered personal service to be lacking or low with the use of QR code for ordering and/or paying at casual dining restaurants.

Table 3*. Mean, standard deviation and correlation of variables.*

Category	M	SD	1	2	3	4	5	6
Usability	3.864	.827						
Pleasure	3.763	.940	.810*					
Personal Service	3.422	.807	.172*	.021				
Technological Readiness	3.557	1.189	.463*	.452*	.079			
Ease of Use	3.772	.905	.776*	.822*	.003	.474*		
Security	3.399	1.362	.452*	.454*	-.008	.277*	.493*	
Perception	3.668	.927	.639*	.722*	-.90	.432*	.685*	.488*
Satisfaction	3.708	.949	.628*	695*	-.135*	.321*	.728*	.539*

*Note. M and SD are used to represent mean and standard deviation, respectively; * Indicates p<.01.*

Sub-title/topic Consumers' perception and satisfaction of QR code use in casual dining restaurants

In *Table 4*, the results of multiple regression analysis examining the impact of six factors (usability, pleasure, personal service, technological readiness, ease of use, security) on consumers' perception and satisfaction of QR code use. 58.3% of the

variance in customer perception was explained by pleasure, personal service, technological readiness, ease of use, and security. Pleasure has the strongest positive impact on perception (β=0.403, p<.01), indicating that an increase in pleasure significantly improves customers' perception. This is supported by previous findings, where consumers utilized various cellular networks because they believe they are enjoyable and engaging (Nysveen et al., 2005). Consumers' concern and uncertainty may be alleviated by prior enjoyable encounters with technology (Ryu and Murdock, 2013). Additionally, security, ease of use, and technological readiness, all had a positive impact on perception. Meanwhile, personal service negatively affects perception (β=-0.122, p<.01), suggesting that lower level of personal service leads to an increase in perception. On the other hand, 61.4% of the variance in consumers' satisfaction with QR code use was explained by ease of use (β=0.384, p<.01), pleasure (β=0.230, p<.01), and security (β=0.215, p<.01). Personal service again showed a negative relationship (β=-0.152, p<.01). Previous research has found that perceived ease of use improves the satisfaction of customers in using self-service technology (Wu and Cheng, 2018). In this study, personal service is measured by respondents' opportunity to interact with restaurant employees which is considerably lower with QR code use. This is similar to the findings by Nilsson et al. (2021) in which customers perceived the lack of personal service with the use of self-service technology in casual dining restaurants. The results highlight the critical role of personal service in shaping customer experiences in casual dining restaurants. The negative relationships suggest that inadequate personal service detracts from overall customer perception and satisfaction, even when other aspects of service are satisfactory. This finding suggests that restaurants need to prioritize staff training and personalized customer interactions to mitigate these negative effects.

***Table 4**. Regression analysis for perception and satisfaction of QR code use.*

Factors	Perception			Satisfaction		
	B	SE B	β	B	SE B	β
Usability	.107	.071	.095	.115	.070	.100
Pleasure	.398	.066	.403**	.232	.065	.230**
Personal Service	-.140	.040	-.122**	-.178	.039	-.152**
Technological Readiness	.077	.030	.098*	-.047	.030	-.059
Ease of Use	.159	.066	.156*	.403	.065	.384**
Security	.107	.026	.157**	.150	.026	.215**
Adjusted R^2		.583			.614	
F		88.90			101.04	

*Note: * p<.05, **p<.01*

Socio-demographic variances in the adoption of QR code

This study also investigated whether socio-demographic variances exist in the adoption of QR code at casual dining restaurants. Previous studies have highlighted differences in perception and satisfaction of QR code usage, particularly in terms of age (Mazhar et al, 2024; Mohd Zakri et al. 2024; Mendelson and Romano Bergstrom, 2013), and gender-based differences with technological interaction. According to Ray (2021), in Britain; those with a degree, professional or managerial occupation, and high income dine out frequently compared to the working class, and women tend to dine out with kin more than men. Furthermore, people with higher education levels tend to seek healthier foods, display greater willingness to try unfamiliar foods, and have more disposable income for dining out (Traster, 2018). The demographic factors chosen to be

tested against perception and satisfaction were gender, age, ethnicity, education level, and employment status. Independent sample t-test was carried out for gender and employment status; while one-way ANOVA were carried out for the remaining demographic factors. *Table 5* presents a comparison of perception and satisfaction between male and female customers in casual dining restaurant context. Females reported a slightly higher mean perception score (M=3.73, SD=0.93) compared to males (M=3.57, SD=0.94). The t-test result (-1.647) indicates that the difference in perception between genders is not statistically significant. The effect size (Cohen's d=0.930) suggests a medium to large practical significance, even though the difference is not statistically significant. For satisfaction, again females reported a slightly higher mean satisfaction score (M=3.76, SD=0.99) compared to males (M=3.64, SD=0.90). The t-test result (-1.207) again shows no statistically significant difference in satisfaction between genders (p=.100). The effect size (Cohen's d=0.964) similarly indicates a medium to large practical significance, though the difference is not statistically significant. While females reported slightly higher levels of perception and satisfaction than males, the differences are not statistically significant. However, the medium to large effect sizes suggest that gender may still play a meaningful role in shaping perception and satisfaction, which could warrant further investigation with a larger sample size to detect statistical significance.

***Table 5**. Gender comparison for perception and satisfaction.*

Category	Perception					Satisfaction				
	M	SD	t	Sig.	Cohen's d	M	SD	t	Sig.	Cohen's d
Female	3.73	0.93	-1.647	.100	.930	3.76	0.99	-1.207	.100	.964
Male	3.57	0.94				3.64	0.90			

Table 6 presents a comparison of perception and satisfaction between employed and unemployed customers. The findings revealed that employed respondents reported a higher mean perception score (M=3.80, SD=0.89) compared to unemployed respondents (M=3.47, SD=0.93). The t-test result (t=3.500) shows that the difference in perception between the two groups is not statistically significant. The effect size (Cohen's d=0.906) indicates a large practical significance, suggesting that while the result is not statistically significant, the difference in perception between employed and unemployed individuals may be meaningful. The t-test results for satisfaction revealed that employed respondents reported a notably higher mean satisfaction score (M=3.91, SD=0.82) compared to unemployed respondents (M=3.42, SD=1.01). The t-test result (t=5.160) indicates a statistically significant difference in satisfaction between employed and unemployed individuals (p<.001). The effect size (Cohen's d=0.913) suggests a large practical significance, indicating that employment status strongly influences customer satisfaction. While both perception and satisfaction are higher for employed individuals compared to unemployed individuals, only the difference in satisfaction is statistically significant. The large effect sizes in both cases imply that employment status plays a meaningful role in shaping both perception and satisfaction, with employed individuals generally having more positive experiences.

***Table 6**. Employment status comparison for perception and satisfaction.*

Category	Perception					Satisfaction				
	M	SD	t	Sig.	Cohen's d	M	SD	t	Sig.	Cohen's d
Employed	3.80	0.89	3.500	.100	.906	3.91	0.82	5.160	<.001	.913
Unemployed	3.47	0.93				3.42	1.01			

Several one-way ANOVA analyses were carried out to examine different demographic factors affecting perception (*Table 7*) and satisfaction (*Table 8*) of QR code usage to order and/or to pay in casual dining restaurants respectively. The following subsection discusses the results for perception, followed by satisfaction for each demographic factor. The results revealed that socio-demographic variances exist for perception and satisfaction with QR code usage in terms of age, ethnicity, and education level.

***Table 7**. ANOVA for perception score.*

Demographic factors*	Group	Category	F-value	Sig.
Age	>55 years[a]	18-35 years[b] 36-55 years[b]	29.380	<.001
Ethnicity	Bumiputera Sabah[a]	Chinese[a, b] Indian[b] Bumiputera Sarawak[b, c] Malay[c] Orang Asli[b, c]	10.097	<.001
Education Level	High School[a]	Diploma[b] Bachelor's Degree[b, c] Postgraduate Degree[c]	17.495	<.001

*Note: [a,b,c] Groups that share the same subset do not show a significant difference in mean perception; *Tukey HSD post hoc test used to determine mean differences for age; Games-Howell post hoc test used to determine mean differences for ethnicity and education level.*

***Table 8**. ANOVA result for satisfaction score.*

Demographic factors*	Group	Category	F-value	Sig.
Age	>55 years[a]	18-35 years[b] 36-55 years[b]	51.126	<.001
Ethnicity	Bumiputera Sabah[a]	Orang Asli[a, b] Chinese[b] Indian[b] Bumiputera Sarawak[b] Malay[b]	12.732	<.001
Education Level	High School[a]	Diploma[b] Bachelor's Degree[c] Postgraduate Degree[b, c]	14.042	<.001

*Note: [a,b,c] Groups that share the same subset do not show a significant difference in mean perception; *Tukey HSD post hoc test used to determine mean differences for age; Games-Howell post hoc test used to determine mean differences for ethnicity and education level.*

Age and perception

The results showed that age had a significant effect on perception $F(2, 376)=29.380$, $p<.01$. Levene's test showed that the variances across the three age groups were not significantly different $F(2, 376)=2.11$, $p=.123$. Tukey HSD post hoc analysis showed that there was a significant difference in perception between the oldest group (>55 years) and youngest group (18-35 years) $p<.01$, and the mid-age group (36-54 years) $p<.01$. Older consumers (>55 years) consistently had lower mean perception scores than the younger respondents.

Age and satisfaction

Similarly, the results showed that age had a significant effect on mean satisfaction $F(2, 376)=51.126$, $p<.01$. Levene's test showed that the variances across the three age groups were not significantly different $F(2, 376)=.912$, $p=.146$. Tukey HSD post hoc analysis showed that there was a significant difference in perception between the oldest (>55 years) and youngest (18-35 years) $p<.01$, and the 36-54 years $p<.01$. Older consumers (>55 years) consistently had lower mean satisfaction scores than the younger respondents. These findings are in line with previous studies that indicated that fewer baby boomers (aged 60-78 years) said that they would use QR code to view and order food in full-service restaurants compared to their younger counterparts (NRA, 2024).

Ethnicity and perception

The results showed that ethnicity had a significant effect on mean perception $F(5, 373)=10.097$, $p<.01$. Levene's test showed that the variances across the six ethnic groups were significantly different $F(5, 373)=2.488$, $p=.03$. Indicating that the homogeneity of variance is not assumed. The Games-Howell test is used when variances are unequal, making it suitable for analyzing differences in mean perception among ethnic groups. Malay respondents consistently had significantly higher mean perception scores compared to Chinese, $p=.04$, Indian, $p<.01$, and Bumiputera Sabah, $p<.01$. Additionally, the mean perception scores of Bumiputera Sabah were significantly lower than Indian, $p=.05$, Malay, $p<.01$, Orang Asli, $p<.01$, and Bumiputera Sarawak, $p<.01$.

Ethnicity and satisfaction

The results showed that ethnicity had a significant effect on mean satisfaction $F(5, 373)=12.732$, $p<.01$. Levene's test showed that the variances across the six ethnic groups were significantly different $F(5, 373)=2.738$, $p=.02$. Games-Howell test revealed that Bumiputera Sabah respondents consistently had significantly lower mean satisfaction scores compared to all other ethnic groups Chinese, $p=.03$, Indian, $p<.01$, Malay, $p<.01$, and Bumiputera Sarawak, $p<.01$; except Orang Asli.

Education level and perception

Results of one-way ANOVA revealed that educational level had a significant effect on mean perception $F(3, 375)=17.495$, $p<.01$. Levene's test indicated that the variances across the four education levels were significantly different $F(3, 375)=6.417$, $p<.01$. Games-Howell test is used to identify specific differences in education level. Results showed that High School respondents consistently had significantly lower mean perception scores compared to all other education levels; Diploma, $p<.01$, Bachelor's Degree, $p<.01$, and Postgraduate Degree, $p<.01$. Additionally, Diploma holders have significantly lower perception than those with postgraduate degrees, $p=.03$. Indicating higher education levels correlates with higher perception score.

Education level and satisfaction

Similarly, results revealed that educational level had a significant effect on mean satisfaction $F(3, 375)=14.042$, $p<.01$. Levene's test indicated that the variances across the four education levels were significantly different $F(3, 375)=4.734$, $p<.01$. Games-

Howell test indicated that High School respondents similarly had significantly lower mean satisfaction scores compared to Diploma, and Bachelor's Degree ($p<.01$). Additionally, Diploma holders have significantly lower mean satisfaction scores compared to Bachelor's Degree holders, $p<.05$. Again, the results indicated that higher education levels correlate with higher satisfaction scores, with significant differences between high school and all higher education groups. Higher education levels correlate with greater digital literacy, leading to better perception and satisfaction with QR code usage. Additionally, by providing clear instructions and ensuring ease of use will improve customer satisfaction (Mazhar et al., 2024).

Theoretical implications

This study contributes to a better understanding of consumers' perception and satisfaction of QR code usage to order and/or to pay in casual dining restaurants in Malaysia. According to Chui et al. (2016), even when technologies do replace some human tasks in a profession, this does not necessarily mean that the jobs in that field will disappear. Additionally, this study contributes to the literature on technology adoption in hospitality by demonstrating how demographic factors influence QR code perception and satisfaction. The findings align with Technology Acceptance Model (TAM) principles, reinforcing that ease of use, security, and familiarity drive digital adoption. Additionally, the study expands on consumer behavior theories, showing that age, ethnicity, and education level shape digital engagement in service settings. The results suggest that digital literacy plays a crucial role in shaping consumer experiences, supporting prior research on technology readiness and user acceptance. By integrating these insights, scholars and practitioners can refine digital service strategies, ensuring QR code ordering systems remain accessible, efficient, and engaging for all consumers.

Practical implications

The findings of this study provide valuable insights for restaurant management and digital ordering system optimization. Some key practical implications are; enhancing QR code usability, strengthening security measures, balancing automation and personal service, leveraging pleasure for customer engagements, and addressing technological readiness gaps. Restaurants should design intuitive and user-friendly QR code interfaces to improve customer perception and satisfaction. Additionally, simplified navigation and clear instruction can help first-time users adapt more easily. Since security significantly influences both perception and satisfaction, restaurants must ensure secure payment gateways and data protection policies to build consumer trust. While QR code ordering improves efficiency, excessive automation may reduce customer engagement. Providing optional human assistance and training staff to guide customers through the process can help maintain service quality. Interactive features such as personalized recommendations, loyalty rewards, and visually appealing digital menus can enhance customer enjoyment, leading to higher satisfaction. Additionally, restaurants should offer alternative ordering methods to less tech-savvy customers and ensure staff are trained to assist those unfamiliar with QR code systems. This would be especially helpful for older customers (>55 years). Restaurants in Malaysia may also consider ensuring language accessibility in QR code menus to accommodate diverse ethnic groups. By implementing these strategies, restaurants can maximize customer

perception and satisfaction, ensuring the QR code ordering remains an efficient, secure, and enjoyable experience for all demographics.

Limitations of study and suggestions for future research

This study has several limitations that should be acknowledged, which provide opportunities for future research to enhance understanding of QR code adoption in casual dining restaurants. Firstly, while the quantitative approach offers strong statistical insights, the absence of qualitative data (e.g., interviews or open-ended responses) limits the depth of understanding regarding consumer motivations, concerns, and behavioral nuances. Incorporating mixed-method research in future studies could provide richer insights into why consumers perceive and experience QR code ordering differently. Secondly, limited prior research exists on consumer perception and satisfaction with QR code ordering and payment in casual dining restaurants, particularly in Malaysia. Most existing studies focus on tourism and hospitality, leaving a gap in understanding how QR codes influence everyday dining experiences. Future research should explore different restaurant formats (e.g., fine dining, fast food) and cross-cultural comparisons to expand the scope of findings. Thirdly, the study relies on purposive sampling and online questionnaire distribution, which may introduce sampling bias. Individuals who do not frequently use social media or online platforms may be underrepresented, potentially skewing the results toward tech-savvy consumers. Future studies should consider multi-channel data collection (e.g., in-person surveys, telephone interviews) to ensure a more diverse and representative sample. Finally, while the sample size is adequate, the findings may not be fully generalizable to other countries or different types of dining establishments beyond casual dining restaurants in Malaysia. Future research should examine regional variations, cultural influences, and consumer preferences in different markets to validate and extend these findings. By addressing these limitations, future studies can provide a more comprehensive understanding of QR code adoption, ensuring that digital ordering systems are optimized for diverse consumer needs across different demographics and restaurant settings.

Conclusion

This study examined the impact of various factors on perception and satisfaction with QR code usage in casual dining restaurants. The findings indicate that pleasure, ease of use, and security are the strongest predictors of both perception and satisfaction, highlighting the importance of user-friendly, enjoyable, and secure digital ordering experiences. Ease of use significantly influences satisfaction, suggesting that customers prefer intuitive and efficient QR code systems that minimize complexity. Similarly, security plays a crucial role in shaping both perception and satisfaction, reinforcing the need for secure transactions and data protection to build consumer trust. Interestingly, personal service negatively impacts both perception and satisfaction. In this study personal service is measured by respondents' opportunity to interact with restaurant employees which is considerably lower with QR code use. This suggests that while automation enhances efficiency, customers may feel disengaged if personal service is entirely removed. Many diners value the human touch in service, such as recommendations, small talk, or personalized attention. QR code usage in dining services can make the experience feel impersonal and transactional. Additionally, technological readiness affects perception but does not significantly influence

satisfaction, implying that familiarity with technology enhances perception but does not necessarily improve overall satisfaction. Not all customers are comfortable using digital menus; older diners or those unfamiliar with QR codes may find the process frustrating, leading to dissatisfaction.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

REFERENCES

[1] Azlan, A.H.M., Ibrahim, S.N., Kamarudin, W.N.B.W., Krisnadi A.R. (2024): What brings you back: Perspectives on how casual restaurant attributes shape Malaysian customers' revisit intentions. – Global Sustainable Tourism Conference: Charting Paths for Responsible Travel (GLOST) 2024 8p.

[2] Baiomy, A. (2021): What is the most prominent technology challenge in restaurants? An empirical study. – International Tourism and Hospitality Journal 4(2): 1-11.

[3] Chui, M., Manyika, J., Miremadi, M. (2016): Where machines could replace humans-and where they can't (yet). – McKinsey Quarterly 17p.

[4] Daud, A., Farida, N., Andriyansah, Razak, M. (2018): Impact of customer trust toward loyalty: The mediating role of perceived usefulness and satisfaction. – Journal of Business & Retail Management Research 13(2): 235-242.

[5] Giovanis, A., Assimakopoulos, C., Sarmaniotis, C. (2019): Adoption of mobile self-service retail banking technologies. – International Journal of Retail & Distribution Management 47(9): 894-914.

[6] De', R., Pandey, N., Pal, A. (2020): Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. – International Journal of Information Management 55: 6p.

[7] Department of Statistics Malaysia (DOSM) (2024): Population Table: Malaysia. – DOSM 5p.

[8] Guo, X., Ling, K.C., Liu, M. (2012): Evaluating factors influencing consumer satisfaction towards online shopping in China. – Asian Social Science 8(13): 40-50.

[9] Hakim, A. (2025): Eat. Lepak. Repeat. Why Malaysians Can't Live Without Eating Out. – The Rakyat Post Web Portal 9p.

[10] Hyppönen, H., Kaipio, J., Heponiemi, T., Lääveri, T., Aalto, A.M., Vänskä, J., Elovainio, M. (2019): Developing the national usability-focused health information system scale for physicians: Validation study. – Journal of Medical Internet Research, 21(5): 24p.

[11] Intal, G.L., Payas, J.D., Fernandez, L.M., Domingo, B.M. (2020): Restaurant information system (RIS) with QR code to improve service operations of casual fine dining restaurant. – In 2020 IEEE 7th International Conference on Industrial Engineering and Applications (ICIEA), IEEE 6p.

[12] Ishak, F.A.C., Che Lah, N.A., Samengon, H., Mohamad, S.F., Bakar, A.Z.A. (2021): The implementation of self-ordering kiosks (SOKS): Investigating the challenges in fast food

restaurants. – International Journal of Academic Research in Business and Social Sciences 11(10): 1136-1150.

[13] Johnson, V.L., Woolridge, R.W., Wang, W., Bell, J. R. (2020): The impact of perceived privacy, accuracy and security on the adoption of mobile self-checkout systems. – Journal of Innovation Economics & Management 31(1): 221-247.

[14] Karim, R.M., Abdullah, M.S., Rahman, A.M., Alam, A.M. (2016): Identifying role of perceived quality and satisfaction on the utilization status of the community clinic service; Bangladesh context. – BMC Health Services Research 16: 16p.

[15] Lawrence, A. (2023): Costly to eat out but Malaysians don't have a choice. – Free Malaysia Today Web Portal 10p.

[16] Lydiatul Shima, A., Ainaa Almardhiyah, A.R., Shahril, M.R., Yeong, Y.L., Yee, C.K., Bibi Nabihah, A.H., Nor Hamizah, S., Raja Affendi, R.A., Hamid Jan, J.M. (2022): Exploring the norms of eating-out practice among adults in Malaysia. – Malaysian Journal of Nutrition 28(1): 031-041.

[17] Liu, Y., Jang, S.S. (2009): Perceptions of Chinese restaurants in the US: What affects customer satisfaction and behavioral intentions? – International Journal of Hospitality Management 28(3): 338-348.

[18] Mazhar, A.F., Salleh, N.A.N., Usman, S.B., Dzia-Uddin, D.N., Kamaruddin, W.N.B.W. (2024): Assessing the customer perception of quick response (QR) code application and their purchase intention in Penang's casual dining restaurants, Malaysia. – Asian Journal of Research in Education and Social Sciences 6(S1): 30-43.

[19] Mendelson, J., Romano Bergstrom, J.C. (2013): Age differences in the knowledge and usage of QR codes. – In International Conference on Universal Access in Human-Computer Interaction, Berlin, Heidelberg: Springer Berlin Heidelberg 6p.

[20] Mohd Zakri, N.A.S., Nawawi, N.N., Mat Ghani, A., Abd Hamid, M., wan Nawawi, W.N., Mohd Isa, S. (2024): The role of QR code applications in enhancing customer satisfaction at restaurants: A conceptual study. – Asian Journal of Research in Education and Social Sciences, Special Issue (Future Horizons: Challenges and Opportunities in Global Hospitality and Tourism) 8p.

[21] Na, T.K., Lee, S.H., Yang, J.Y. (2021): Moderating effect of gender on the relationship between technology readiness index and consumers' continuous use intention of self-service restaurant kiosks. – Information 12(280): 13p.

[22] National Restaurant Association (NRA) (2024): Restaurant technology landscape report 2024. – NRA 24p.

[23] Nguyen, M.T., Alang, T. (2024): When do shoppers prefer using QR codes? Empirical evidence from Vietnam. – Future Business Journal 10: 21p.

[24] Nilsson, E., Pers, J., Grubbströ, L. (2021): Self-service technology in casual dining restaurants. – Services Marketing Quarterly 42(1-2): 57-73.

[25] Nysveen, H., Pedersen, P.E., Thorbjørnsen, H. (2005): Intentions to use mobile services: Antecedents and cross-service comparisons. – Journal of the Academy of Marketing Science 33(3): 330-346.

[26] Ozkaya, E., Ozkaya, H.E., Roxas, J., Bryant, F., Whitson, D. (2015): Factors affecting consumer usage of QR codes. – Journal of Direct, Data and Digital Marketing Practice 16: 209-224.

[27] Parasuraman, A. (2000): Technology Readiness Index (TRI) a multiple-item scale to measure readiness to embrace new technologies. – Journal of Service Research 2(4): 207-320.

[28] Ramayah, T., Ignatius, J. (2005): Impact of perceived usefulness, perceived ease of use and perceived enjoyment on intention to shop online. – ICFAI Journal of Systems Management 3: 36-51.

[29] Ray, K. (2021): The Social Significance of Dining Out: A Study of Continuity and Change. – Contemporary Sociology 50(6): 523-525.

[30] Ryu, J.S., Murdock, K. (2013): Consumer acceptance of mobile marketing communications using the QR code. – Journal of Direct, Data and Digital Marketing Practice 15: 111-124.
[31] Shahid Iqbal, M., Ul Hassan, M., Habibah, U. (2018): Impact of self-service technology (SST) service quality on customer loyalty and behavioral intention: The mediating role of customer satisfaction. – Cogent Business & Management 5(1): 1-23.
[32] Shim, H.S., Han, S.L., Ha, J. (2020): The effects of consumer readiness on the adoption of self-service technology: Moderating effects of consumer traits and situational factors. – Sustainability 13(1): 17p.
[33] Traster, D. (2018): Foundations of menu planning. – Pearson 272p.
[34] Vaportzis, E., Clausen, M.G., Gow, A.J. (2017): Older adults' perceptions of technology and barriers to interacting with table computers: A focus group study. – Frontiers in Psychology 11p.
[35] Winter, M. (2011): Scan me-everybody's guide to the magical world of qr codes. – Westsong Publishing 142p.
[36] Wu, H.C., Cheng, C.C. (2018): What drives experiential loyalty toward smart restaurants? The case study of KFC in Beijing. – Journal of Hospitality Marketing & Management 27(2): 151-177.
[37] Wu, K., Zhao, Y., Zhu, Q., Tan, X., Zheng, H. (2011): A meta-analysis of the impact of trust on technology acceptance model: Investigation of moderating influence of subject and context type. – International Journal of Information Management 31(2011): 572-581.
[38] Xu, X., Chen, P., Wang, J., Feng, J., Zhou, H., Li, X., Zhong, W., Hao, P. (2020): Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. – Science China Life Sciences 63: 457-460.
[39] Taherdoost, H. (2019): What is the best response scale for survey and questionnaire design; review of different lengths of rating scale/attitude scale/Likert scale. – International Journal of Academic Research in Management 8(1): 1-10.
[40] White, A., Breazeale, M., Collier, J.E. (2012): The effects of perceived fairness on customer responses to retailer SST push policies. – Journal of Retailing 88(2): 250-261.