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Research Article

MEASURING THE TENDENCIES OF CUSTOMERS TO USE QR CODE MENU IN RESTAURANTS

Binali KILIÇ[1*] (orcid.org/ 0000-0001-8345-6617)

Ülker CAN[2] (orcid.org/ 0000-0001-8244-5190)

Gül Esin DELİPINAR[3] (orcid.org/ 0000-0001-5402-708X)

Önder YAYLA[4] (orcid.org/ 0000-0002-7967-1805)

İbrahim GÖNEN[5] (orcid.org/ 0000-0002-2645-8138)

M. Onur GÜLBAHAR[6] (orcid.org/ 0000-0003-2959-0836)

Emel GÖNENÇ GÜLER[7] (orcid.org/ 0000-0002-3214-0206)

[1]Balıkesir Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Uluslararası Ticaret ve Lojistik Bölümü, Balıkesir, Türkiye

[2]Batman Üniversitesi, Hasankeyf Meslek Yüksekokulu, Otel, Lokanta ve İkram Hizmetleri Bölümü, Batman, Türkiye

[3]Altınbaş Üniversitesi, İşletme Fakültesi, Uluslararası Lojistik Yönetimi Bölümü, İstanbul, Türkiye

[4]Osmaniye Korkut Ata Üniversitesi, Kadirli UBF, Gastronomi ve Mutfak Sanatları Bölümü, Osmaniye, Türkiye

[5]Nişantaşı Üniversitesi, Sanat ve Tasarım Fakültesi, Gastronomi ve Mutfak Sanatları Bölümü, İstanbul, Türkiye

[6]Batman Üniversitesi, Turizm Fakültesi, Turizm İşletmeciliği Bölümü, Batman, Türkiye

[7]Trakya Üniversitesi, Uygulamalı Bilimler Fakültesi, Turizm İşletmeciliği Bölümü, Edirne, Türkiye

Abstract

In the post-COVID-19 outbreak period, the use of QR-coded menus in restaurants has become a necessity due to customers' demands for more hygiene. In this context, it was decided to measure the trend and importance of QR code usage in restaurants, and research was conducted on the subject. Therefore, in order to discover the link between perceived ease of use in restaurants, perceived usefulness and customer's intention to use, we examined whether there are relevant studies in the literature regarding the use of QR-coded menus. When the literature is researched, there is no study was found showing that the Technology Acceptance Method (TAM) model was used for the applicability of QR-coded menus used in restaurants. Therefore, TAM model was used in this study. The scope of the study was created by participating in an online survey of 635 restaurant customers, mostly from the Z generation, in Türkiye. By the help of statistical evaluation of the data, QR-coded menus usage is observed in restaurants. In the end of the study results has shed light on understanding tendency to use QR code. Result indicate that QR code ease of use significantly contributes to perceived usefulness and intention to use. The study was concluded by making suggestions regarding the use of QR-coded menus in restaurants, in order to prevent customers from being victims and to prevent damage to the reliability of the business, in case these menus are used by malicious people.

Keywords: Customer Satisfaction, Gastronomy, Marketing, Restaurants, QR Code Menus, Technology Acceptance Model

Introduction

Today, term Industry 4.0, which means renewing existing industry by taking advantage of digitalization and new technologies, is widely used in the industry (Rojko, 2017). In addition, Industry 4.0 comes to the forefront as a combination of physical and digital technologies (Üstündağ and Cevikcan, 2017). It is considered that the concept of Industry 4.0 has the ability to radically change social life, working life and interpersonal relations (Yıldız and Davutoğlu, 2020: 302). In addition, with Industry 4.0, production can be made quickly and safely today. In this way, it is observed that it is possible for products or services to be long-lasting and of high quality by preventing potential problems in advance and using machine power instead of man power (Şekkeli and Bakan, 2018).

In addition to all these, the adoption of technology in restaurants and QR-coded Menus entered the literature in 2011 with Germany's Hannover Fair (Xu, Xu, and Li, 2018). In the publications made in this direction recently, it is observed that studies on the subject have started to take place frequently in the service sector as well as on the adoption of technology in restaurants and the use of QR-coded menus.

Literature Review

In the literature review, the use of Industry 4.0 applications in the manufacturing sector is quite common, but similar studies are limited in the service sector (Öztürk, 2020). The food and beverage industry, which is very important for the tourism industry, has also benefited greatly from technology (Trivedi, Teichert and Hardeck, 2019; Yıldız and Davutoğlu, 2020: 305). In the literature, it is observed that there are studies on the use of technology in the fields of Tourism and Gastronomy which mentions the usability of robot waiters in food service (Bartodziej, 2017: 71). There are also more studies on the role of the drones in the service industry and their use in food distribution services (Hwang, Lee and Kim, 2019). Furthermore, it is important for businesses to create customized virtual foods online with their design models and that food designs created by kitchen chefs and gastronomists can be reproduced anywhere using 3D printers (Baiano, 2022). Additionally, it is easier to make special design products thanks to the use of 3D printers in restaurants and that it is possible to obtain products of the same quality by using standard recipes. (Sun, et al., 2015). Food delivery platforms, artificial intelligence and service robots became milestones for businesses' efforts to adapt to the technological age (Ostrom et al., 2015; Larivière et al. 2017).

Other studies stress that technological developments provide extra convenience to customers by providing digital wallet payments, flexible payment facilities and thus speeding up shopping. (Singh and Rana, 2017). Eventually, the value of customer communication created by technology has increased. (Seyitoğlu and Ivanov, 2020). The use and approval of information technologies by customers is important for the success of the system (Al-Emran, Mezhuyev, Kamaludin and Shaalan, 2018).

The Conceptual Framework

The milestone reached with today's technology; communication has started in virtual environments over the "internet of things" (IOT) (Topsakal et al., 2018: 3). However, there is increasing interest in technology adoption in consumer environments in relevant market segments (Gursoy, Chi, and Chi 2020; Iskender, Sirakaya-Turk, Cardenas, and Hikmet, 2022). With these environmental effects, businesses have started to use e-commerce and mobile marketing actions, which basically cover marketing activities, in every sector by taking place in the virtual world.

Basically, e-commerce is the production, advertisement and sale of products and services on the internet and/or various technological devices in a secure environment (Yamamoto, 2013). Today as in e-commerce in other sectors, the concepts of e-tourism and mobile tourism come to the fore in tourism, and it is observed that touristic expenditures are increasingly virtual.

Promotion, advertisement and sales activities carried out over mobile phones since the beginning of the 2000s have now formed a separate business line as the "mobile marketing sector", and the size of this sector in Türkiye has exceeded 150 million dollars as of 2011 (Yamamoto, 2011). At the point reached today, it is possible to say that the size of the mobile marketing industry is on a much larger scale. It has been observed that mobile marketing has reached enormous dimensions as a sector and many new businesses have entered the sector in line with the changing and developing customer needs and demands during and after the Covid-19 epidemic.

Today, e-commerce and mobile commerce still maintain their importance as today's rising commercial trends (Patsiotis, Atik and Perrea, 2020). In this respect, mobile marketing is defined by some authors as the realization of goods or services, ideas, actions and personal marketing activities by reaching the consumer using tools such as mobile phones and pocket computers (Gönen and Telli Yamamoto, 2018). These opportunities also help business managers to monitor their sales processes more closely by analyzing their customers.

Technology Adoption in Restaurants and the QR Code Menus

Restaurant menus are part of the marketing and it is essential for communicating restaurants' products to the customer (Dennis, 2023). Restaurant menus are an important reference for customers to revisit the establishment and sometimes even more important than the location of the restaurant (Mohammed Baiomy, Jones, El-Din Elias and Dinana, 2013). The restaurant industry, which is one of the bearer of the complex and

labor-intensive market in the service sector, is in a struggle to survive with its current and future trends. In terms of keeping safe from rigor mortis in the relevant market, the attempts of businesses to adapt continuously changing and developing trends to their operations is an unavoidable strategical must for both businesses and customers (Can, 2021). At this point, different from printed menus, QR-coded menus cover all kinds of menus that exist in the digital environment and can be used with tools such as tablets, kiosks, boards and smartphones (Sahin, 2020: 2375). At this point, QR code applications in restaurants are in an important position in terms of providing a mobile marketing environment where customers can access not only the product information on the menu, but also other marketing communication messages that the business will want to convey to them. Moreover, it is very easy for each business, especially food and beverage businesses, to determine and implement a QR code independently, and it is less costly than conventional printed menus.

It has been known that customers often spend less than two minutes getting an idea of the concept, price range and type of food (Dennis, 2023). The service quality in the restaurants is simply compared by the perceptions and expectations of the customers (Duman, 2020). Therefore, it becomes important to be prepared to meet the demands and satisfaction of the customer, and to create a fast reaction, especially to keep up with the speed of the Z generation. In this case, it can be said that QR code menus are very useful.

QR, which is the English abbreviation of the concept of quick response, is used in many areas from industry to social media, from payment systems to online menus (Paynet, 2022). Creating a personal QR code is pretty easy. For this, data matrix can be created by downloading any QR code generator application to a computer, tablet or mobile phone.

Access to information becomes faster with the QR code application, and targeted information can be easily accessed with a simple application installed on smartphones and the camera of the phone. During the barcode reading process, the recorded image is analyzed and the barcode content can guide the user to the desired information (Onat, 2016). In addition, QR-coded menus stand out as more successful tools in advertisements than printed menus due to their ability to attract more customers (Vuksanović, Bajrami, Petrović and Grigorieva, 2020: 20). Besides all this, QR code applications are in an important position in terms of providing a mobile marketing environment where customers can reach not only the product information on the menu, but also other marketing messages that the business wants to convey to them. QR code applications, which create environments that arouse curiosity in people, also create a very suitable environment for guerrilla-style marketing campaigns (Onat, 2016).

Methodology

Research Model and Hypotheses

One of the most used theories used in the literature on consumers' use of information technologies is TAM (Man, Alabdulkarim, Chan, and Zhang, 2021) TAM model developed by Davis (1985) is actually based on the "Theory of Planned Behavior" and that it aims to understand and explain people's acceptance and use of technological developments (Fishbein and Azjen, 1975; Turan, 2008). This model emerges as a model that explains and predicts people's behavior of using technology and their hesitations about whether to use it or not. (Liao and Cheung, 2002). The main goal of TAM development is to explore the effects of external variables on internal variables such as beliefs, behaviors and desires (Legris, Ingham and Collerette, 2003).

In this study, the Technology Acceptance Model has been preferred as the research model. The technology acceptance model is classified as Perceived Usefulness (PU), Perceived Ease of Use (PEoU) and Intention of Use (IU). "Perceived ease of use" and "perceived usefulness" factors are variables that measure the level of customers' belief in information technologies (Koul and Eydgahi, 2017: 106). In addition, in the study conducted it is claimed that different external factors created within the framework of TAM have important effects on customers' adoption of the system (Kalyoncuoğlu, 2018: 197).

In this context, it has been evaluated that it is important to examine QR-coded menus, which are almost free compared to other technologies and ensure hygienic order processes of both businesses and customers, in terms of technology acceptance model. In this direction, the TAM model is used in our study.

When it comes to restaurant success, it is critical to determine how customers' perceptions of QR-coded menus will affect their IU within the TAM framework. From this point of view, it is aimed in this research to examine the effects of QR-coded menus on customers' perceived ease of use and the relationships between other variables.

The hypotheses of the study are as follows:

H$_1$: Perceived ease of use has a positive effect on perceived usefulness.

H$_2$: Perceived usefulness has a positive effect on intention of use.

H$_3$: Perceived ease of use has a positive effect on intention of use.

H$_4$: Perceived usefulness has a mediating effect on the relationship between ease of use and intention to use.

Measures and Data Collection

The questionnaire, has created in the research to measure the structures of the study has been adapted from previous studies in the literature, as suggested. (Kline, 2005). In this study, it is desired to measure the intention to use put forward by Davis (1989). For this, the perceived ease of use scale and the perceived usefulness scale, which has been developed by (Hu, Clark, Ma) in 2003 and later adapted by Turan (2011) and Torun and Cengiz (2019), are used. Ethics committee approval was received by Nişantaşı University Ethics Committee, dated 06.07.2022 and 2022/29 approved by the decision.

Five-point Likert scale has been used for the variables and the reliability of the questionnaire items has been evaluated in this way. Here (1) means "strongly disagree" and (5) means "strongly agree". As presented in Table 2, the Cronbach's alphas of each construct ranged from 0.796 to 0.918. This defines a satisfactory level of reliability. (Hair, Black, Babin, Andersho, and Tatham, 2006).

It has been decided to collect the data from customers using QR-coded menus in restaurants in Türkiye via questionnaires. Participation criterion has been determined as using a QR-coded menu. Researchers have been tried to reach as many customers as possible during the data collection period. The "convenience sampling method" has been applied to the collected data. Data have been collected via the WhatsApp application in the form of questionnaires distributed online using Google forms. Between 07 July and 31 October 2022, 635 questionnaires have been answered and all of them have been evaluated.

About the gender, education and age categories of the participants (the generation Z: born 1996 and after. the generation Y: born 1977 to 1995 and the generation X: born 1965 to 1976). 59.4% of those who answered the survey questions consisted of 377 female participants. 40.6% consists of 258 male participants. It has been revealed that the majority of the respondents, 61.9%, are undergraduate graduates, and 73.1% of the participants are in the Z generation.

Table 1. Respondents' Characteristics

Descriptors	Sub-descriptors	Frequency (n=635)	Percentage
Gender	Male	258	40.6
	Female	377	59.4
Education	Secondary school	9	1.4
	High school	48	7.6
	Associate degree	95	15
	Bachelor's degree	393	61.9
	Graduate school	90	14.1
Gen.	X	81	12.8
	Y	90	14.2
	Z	464	73

RESULTS

Measurement Model

SPSS & AMOS 22 program has been used for data analysis. Confirmatory factor analysis have been used to determine the reliability and validity of the study. Confirmatory factor analysis (CFA) have been performed to validate the measurement model (Hair et al., 2006). According to the results obtained, it has revealed that the applied model showed a good fit. ($\chi2 = 106,186$ df = 30, $\chi2$/df = 3,540 (p <0.000), TLI= 0.978, CFI= 0.985, and RMSEA= 0.063. As shown in Table 2, all loadings (> .50) have been significant.

The average variance extracted (AVE) by each latent variable has been equal to or greater than .50. Consequently, convergent validity has been succeeded (Anderson and Gerbing, 1988). And also, Table 2 demonstrated that composite reliabilities values are above 0.7. These findings showed that each measure has been reliable. (Bagozzi and Yi, 1988; Hair et al., 2010). As presented in Table 3, Discriminant validity has been achieved. Because the AVE by each latent construct has been larger than the shared variance between all pairs of variables (Hair et al., 2010).

Table II. Scale Items and Confirmatory Factor Analysis Results.

Constructs and items	Loadings	AVE	CR	CA/ICR
Perceived Ease of Use		.730	.915	.918
PEoU1	.847			
PEoU2	.819			
PEoU3	.908			
PEoU4	.842			
Perceived Usefulness		.569	.795	.796
PU1	.587			
PU2	.811			
PU3	.841			
Intention of Use		.734	.891	.880
IU1	.718			
IU2	.946			
IU3	.890			

Model fit statistics: CMIN = 106.186; df = 30; CMIN/df = 3,540; CFI = .98; TLI = .97; PNFI = .74; RMSEA = .063.

Notes: All loadings are significant at the .01 level. CMIN = minimum discrepancy; df = Degrees of freedom; CFI = Comparative fit index; TLI = Tucker-Lewis index; PNFI = Parsimony normed fit index; RMSEA = Root mean square error of approximation; AVE ($\geq$.5) = Average variance extracted; CR ($\geq$.7) = Composite reliability. CA/ICR ($\geq$.7): Cronbach's Alpha/Internal Consistency Reliabilities.

Table III. Discriminant Validity

Construct	Mean	SD	1	2	3
Perceived Ease of Use	3.71	.94	**.854**		
Perceived Usefulness	3.76	.84	.782**	**.754**	
Intention of Use	3.61	.98	.780**	.718**	**.856**

**Correlation is significant at the 0.01 level (2-tailed).

Structural Model

On the basis of the good fit of the CFA model, the structural model and hypothesized relationships have been analyzed using structural equation modeling (SEM) with AMOS 24.

According to the results, customers' perceived ease of use positively influences perceived usefulness (β = .93 p < .00); Hence Hypothesis 1 has been supported. Similarly, perceived usefulness has been positively related to intention of use (β = .41 p < .00); thus, Hypothesis 2 has been supported. The results also supported Hypothesis 3, which states that perceived ease of use has been positively associated with intention of use (β = .49 p < .00). Figure 1. shows the overall structural model with path coefficient values.
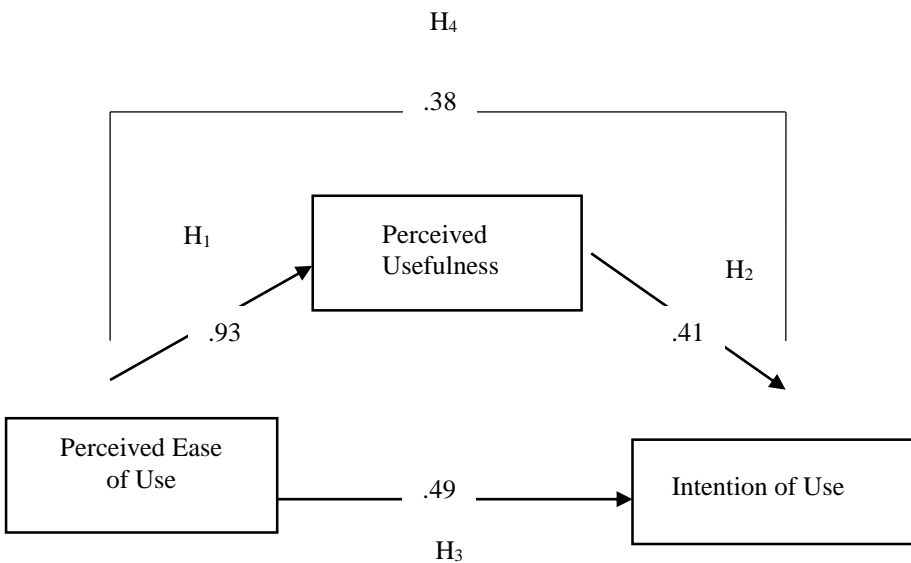
Figure 1. Research Model on Perceived Ease of Use and Intention of Use

Mediating Effect of Perceived Usefulness

Bootstrapping analysis was conducted to measure the significance of the indirect effect of perceived ease of use on intention of use. Bootstrapping analysis at a 95% confidence interval with 2000 bootstrap samples has been performed. According to the results, the indirect impacts of perceived ease of use on intention of use (β = .379, p < 0.05) has been statistically significant (see Table 4). More specifically, it appears that perceived usefulness partially mediates the relationship between perceived ease of use and intention to use. The mediation effect of perceived ease of use on intention of use via perceived usefulness is 0.38 and also significant by the Sobel test (2.36, p<0.01). Therefore, Hypothesis H4 is supported.

Table IV. Direct, Indirect, and Total Effect of Perceived Ease of Use on Intention of Use

	Perceived ease of use		
	Direct effect	Indirect effect	Total effect
Intention of use	0.49*	0.38**	0.87

*p <0.00; **p <0.05 (two tailed).

Open-Ended Questions

Food and beverage businesses have a sensitive position due to the simultaneous production and consumption. In addition, customer-oriented approaches are extremely important in this sector. In this context, determining the perceptions, opinions and suggestions of customers regarding the service offered regarding the use of QR-coded menus in restaurants comes to the forefront as a strategic necessity.

In this study, it has been tried to determine what the customers' feelings and expectations about the QR-coded menu are. Approximately 196 participants for the first question and approximately 117 participants for the second question answered the following two open-ended questions:

● What are the possible benefits of using a digital menu (QR Code) for a food and beverage business?

● What are your suggestions regarding the use of the digital menu (QR Code)?

Participants stated 9 useful features and 8 features about QR code menu usage suggestions. All attributes and characteristics of recurrence frequency are shown in Table 5.

Table V. Repetition Frequency of Beneficial Attributes and Suggestions

Beneficial attributes	n (196)	Suggestions	n (117)
Hygiene for all	49	Make it mandatory for all business	4
Quick menu update for business	19	Get quality software	4
Paper & environment for all	25	Add visual video	2
Reducing printing costs for business	14	Be more understandable	5
Ease of ordering for customer	78	The QR-coded menu is not for everyone (old people, digital ignorance, not have smart phone…) so the physical menu must also be in business	26
Employment cost for business	3	Not everyone has internet so business must provide free wi-fi	6
Ease of access to statistical results for business	1	Waiter and customer relationship, increase employment and quality so no QR code	5
Employee convenience for business	14	The physical menu must also be in business due to personal security concerns	5
Contribution to the institutionalization of the business	1		

As seen in Table 5, the most recurring issue regarding the beneficial attributes of QR code menus has been the ease of ordering for customers. The second is the hygienic ordering process for everyone. The third recurring title can be considered as the contribution of QR-coded menus to the sustainable environment. On the other hand ease of access to statistical results for business and contribution to the institutionalization of the business seem to be cases that have been revealed only once.

The most repeated title at the point of recurring suggestions regarding the use of QR-coded menus is that businesses should also have a physical menu, since QR-coded menus may not be suitable for everyone's use

for various reasons. The second recurring issue is that businesses should have a free wi-fi network for their customers to access them the QR code. One of the other issues raised is that the related menus are more understandable. However, some customers do not think the use of these menus positively as they partially prevent customer-employee communication, while others draw attention to the vulnerability that may arise during the use of QR-coded menus.

Conclusion and Recommendations

Due to the fear and uneasiness in people after the Covid-19 epidemic, restaurant customers refrain from touching the materials touched by others due to hygiene reasons, thus reducing their trust in printed restaurant menus. For this reason, the use of QR-coded menus has come to the fore as an alternative tool that is put into use in line with customer demands. Findings obtained after the study reveal that QR code ease of use significantly contributes to perceived usefulness and intention to use. As a result of the data and statistical evaluations obtained from the researches carried out within the scope of the study, the following results were obtained.

Customers' perceived ease of use positively affects perceived usefulness ($\beta = .93$ p $< .00$); is seen. Therefore, Hypothesis 1 is supported. Similarly, perceived usefulness is positively correlated with intention to use. ($\beta = .41$ p $< .00$); Thus, Hypothesis 2 is supported. Also found ($\beta = .49$ p $< .00$) value also supports Hypothesis 3. In addition, the mediating effect of perceived ease of use on intention to use through perceived usefulness is 0.38, and it is in a significant relationship with the Sobel test. (2.36, p<0.01). Therefore, Hypothesis H4 is supported.

As a result, it is possible to say that the ability of customers to place their orders with QR code due to hygiene, which is extremely important for food and beverage businesses and customers, is an important gain in terms of increasing the profitability of the business and increasing customer satisfaction. As a matter of fact, the results of the research have been formed in a way that confirms our thesis.

This study aims to explore the connection between perceived ease of use, perceived usefulness and intention to use QR menu in food and beverage businesses through the TAM application. It also aims to determine whether the perceived usefulness of using QR menus mediates a link between the intention to use and the perceived ease of use. In addition, during the research, it is tried to determine what the customers' feelings and expectations regarding QR menus are.

However, it is important to reduce and control the costs of enterprises in restructuring and normalization efforts, in managing the crisis situations that occurred during and after the major disasters, as in the great earthquake disaster that took place in Türkiye on February 6, 2023. In such cases, it is considered more rational to use less costly QR-coded menus instead of using printed menus with high costs, especially in food and beverage businesses and hotels.

Theoretical Implications

There are very few studies in the literature on the use of QR code menus in restaurants. In addition, there is no study in the literature that shows the mediating effect of perceived usefulness with the TAM model on the acceptance of QR-coded menus used in restaurants. This study provides valuable information in order to eliminate the lack of studies on the use of QR-coded menus in food and beverage businesses. In this study on the use of QR-coded menus in gastronomy businesses in the post-Covid-19 period, it is considered that the use of the TAM model is important in terms of contributing to the literature.

Practical Implications

In this study, there are various practical information about the use of QR-coded menus in restaurants. First, this study has been showed that QR code menus were easily adopted by most of the participants. It is considered that it is very important to use QR-coded digital menus instead of the classical menus that people are in constant contact with, especially in food and beverage businesses, and this will provide a competitive advantage to businesses. At this point, thanks to the use of QR-coded menus, both businesses and customers benefit from this situation.

Secondly, it has been observed that the Z generation is more familiar with QR coded menus and they are pioneers in adapting to such new technologies. Based on the research data obtained, it is evaluated that the use of QR codes in businesses is a technological innovation, attracting the attention of especially the Z generation youth, and therefore creating significant gains in terms of increasing sales and operating profitability.

Thanks to this research study, important data that is important for the acceptance of QR code use by customers and that we hope will be a reference for those who will do research on the subject have been reached. In this context, it is recommended that businesses take the necessary steps at the point of perceived benefit when creating QR code menus for their businesses. Because it is seen that the most important factor in the model is perceived benefit. Thus, the restaurant will go beyond its real food and beverage service providers role and become valuable sincere partners, who arehighly interested in the customers' needs (Can, Okat and Çakır, 2022).

Today, it is foreseen that hygiene is a key element for the service sector and that QR-coded menus can be turned into an opportunity for the restaurant sector (Türkmendağ, Erdem and Akyürek, 2021). Nowadays, it has been observed that people's desire to order without touching the menus has increased, especially during the Covid-19 epidemic. In this case, the fact that customers have the opportunity to order with a QR code is considered an important gain for both customers and restaurants (Le, 2021). In fact, in this study, the way to make this technological adaptation permanent and easy to apply is explained. In addition to all these, some measures should be taken by the administrators in order to prevent customers from being victimized by malicious people (hacking, fraud, etc.) due to the QR code application.

Considering that the business uses the QR codes affixed to the tables, indoors or outdoors, it is clear that it is possible to foresee that it will be possible to turn into a tool that will create security weakness, and that it is a necessity for business managers and employees to take relevant security measures. At this point, it is important not to allow abuse. Otherwise, if customers become victims, this may cause the restaurant's credibility to be damaged and restaurant managers to be in a difficult situation. Usually, QR-coded menus are placed on restaurant tables, special plaques, etc., that businesses' customers can easily access. It is affixed to the service. The aforementioned drawbacks here are possible by the malicious people activating their own barcodes, which they place on the QR code prepared by the business.

In order to prevent such negativities, QR codes used by the business should not be affixed to desks in a random and unprotected way. Instead, it should be placed in sheltered, framed environments and frequently checked by operating personnel, and should never be left exposed or unprotected after service or when the facility is not in service. At the end of the service, it must be collected and secured. Before going back to the service the next day, safety checks must be done carefully.

Limitations and Future Research

During the research, some limitations of our study emerged. First of all, while evaluating the QR-coded menus, food and beverage businesses were not considered separately. Because, according to the type of food and beverage business (bar, cafe, casual, fast-food, fine dining, thematic restaurants etc.), the structures in the TAM model may differ. This is because customers do not have the same expectations from every type of restaurant. This naturally changes the expectations of customers from technology.

Second, the findings of this study were taken as a whole and evaluated without going into too much detail on the effects of the Covid-19 pandemic. It is considered that this study will be a reference for researchers for similar studies to be conducted in the future, and at the same time, it will be possible to conduct new comparative or meta-analysis studies.

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