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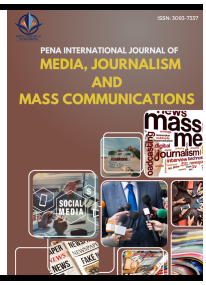

Exploring the Challenges and Limitations of QR Code Digital Menus: Perceptions of Rural Adult Customers in Sabah, Malaysia

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ABSTRACT

Digital menus are an innovation used in the restaurant business to allow customers to scan menus using the QR code provided. These QR code–based menus are not merely digital copies of physical menus; instead, they are interactive platforms that enable customers to browse, identify, and select their preferred dishes, as well as place orders and make payments conveniently. This study explores rural adult customers' perceptions of QR code-based digital menus in Sabah, Malaysia. The need for this study arises because some existing research has expressed scepticism about digital menus, assuming that physical or traditional menus are consistently superior. This study uses a qualitative method, namely in-depth semi-structured interviews with 21 informants from seven districts in the rural areas of Sabah. In addition, this study uses a purposive sampling method by selecting informants who are from rural areas of Sabah. A total of six questions were used as a guide, and three additional questions were asked during the interview. Thematic analysis revealed two key themes: i) Challenges of QR Code Digital Menus and ii) Limitations of QR Code Digital Menus. In conclusion, the implementation of QR code digital menus has its own advantages and constraints depending on age, technology, and internet access. This study suggests that a more in-depth and detailed study be conducted over a more extended period of time, with comparisons made between urban and rural customers.

1. Introduction

In 2019, before the COVID-19 pandemic, most restaurants primarily relied on physical menus printed on paper. However, during and after the onset of COVID-19, the use of digital menus was introduced and has since become increasingly widespread. This shift was largely due to physical distancing measures of at least one meter, as recommended by the World Health Organisation (WHO), to prevent the spread of the virus through direct, indirect, or close contact [1]. The pandemic posed significant challenges to the food and beverage (F&B) sector, as the rapid spread of the virus discouraged customers from visiting restaurants and prompted them instead to place orders online

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[2]. Following the transition of COVID-19 to an endemic phase, the use of digital menus expanded and was gradually adopted by many restaurants [3,4]. To support infection prevention procedures, Quick Response (QR) codes were integrated into F&B services to minimise physical contact and reduce transmission risks. Consequently, digital menus remain an important tool during the endemic period, enabling safer dining experiences through digital displays [5].

Digital menus represent an innovation in the restaurant industry, allowing customers to browse options conveniently and without unnecessary complexity [6]. These menus are not merely digital replicas of physical versions but serve as interactive platforms that enable customers to scan, identify, and select preferred dishes, as well as order and pay seamlessly [5]. Unlike printed paper menus, digital menus are displayed on screens, tablets, kiosks, and smartphone applications, commonly referred to as e-menus, electronic menus, or digital menus [7,8]. Additionally, QR code-based menus can be accessed via smartphones with built-in cameras or third-party QR code scanners, which are widely available and capable of interpreting codes reliably [7].

This study is motivated by existing research that questions the effectiveness of digital menus and assumes that physical or traditional menus are inherently superior [9]. Some studies argue that when digital menus are introduced, they play an equal or even lesser role than physical menus in shaping customer attitudes, behaviours, and feedback [2,9]. Others acknowledge that digital menus are not ineffective or irrelevant as marketing communication tools but contend that they lack the tactile and experiential qualities of traditional menus. Nonetheless, digital menus have been recognised for improving efficiency, particularly by saving time when placing orders [5,9]. QR code applications in restaurants also play an important role in creating a mobile marketing environment, allowing customers to access not only menu information but also other marketing messages that the business wishes to convey [10].

The use of QR code digital menus in the F&B industry presents several challenges and limitations, particularly among adult customers. Although they are increasingly adopted for efficiency and convenience, many customers still face difficulties in adapting to this technology due to factors such as age, low digital literacy, and varying levels of technological acceptance. Limited internet access and inconsistent Wi-Fi quality further hinder the effective use of digital menus, especially in rural or semi-urban areas [2]. In addition, issues such as small font size, poor visibility, and interface complexity reduce the accessibility of these menus for older adults [11]. Privacy concerns also arise, as customers are often required to share personal data when accessing digital menus. Collectively, these challenges highlight the need for further improvements to ensure that digital menus are inclusive, user-friendly, and secure for all age groups [10].

1.1 Research Objective

This study explores the challenges and limitations of QR Code Digital Menus among rural adult customers in Sabah.

1.2 Literature Review

The development of the digital technology era has now changed the pattern of people's daily activities in terms of communication, interaction, employment, and business. Therefore, the restaurant and business industries also use technology to facilitate management and improve the quality of their operations.

The F&B industry, such as McDonald's restaurants, has its own mobile application system to make it easier for customers to place orders via their smartphone screens. It is known as one of their

business strategies for improving service quality and increasing restaurant profits. People now prefer to get foods they crave easily and quickly, including ordering food with just a few clicks using their fingertips [2,5].

The perception of interactive digital menus (websites and tablets) influences customer attitudes toward ordering food. In addition, the use of new and sophisticated technology, such as digital menus, can further improve customer service, making it more efficient and satisfying. Digital menus can also encourage customers to order more in a shorter period of time [9].

Next, the design of digital menus influences public perception in China. A survey conducted on digital menus found that video-based on-screen displays are the most effective in shaping consumer behaviour, followed by digital menus in text and image formats. In addition, the study also shows that digital menus with multimedia content have been adopted and have become an inevitable trend in the restaurant sector in China [4].

The implementation of technology, such as digital menus, in the restaurant industry can improve the customer experience by offering a seamless and globalised dining experience. Furthermore, digital menus are seen as helpful during the ordering process because of their efficient, simple, and user-friendly nature. This system also functions as a booking medium that provides information and menu lists [2].

In addition, a study by Mohamed *et al*., [5] explains that interactive digital menus provide enjoyment for customers when placing orders. Digital menus also have a significant positive impact on customer satisfaction and behaviour. Their implementation in the restaurant sector is a powerful tool for generating profits, as digital menus have a strong influence on customers. Moreover, digital menus can easily increase sales and allow restaurant operators to provide clear images, types of food, food information, and detailed descriptions of ingredients that can influence customer satisfaction.

1.3 Grounded Theory

This study employs grounded theory to explain an ongoing process and develop new theories. The fundamental application of grounded theory is that it can generate fresh ideas and theories when existing ones fail to address the problem being studied. This very theory serves as the basis for the data and explains it more clearly than existing theories.

By analysing data, researchers can get clues about the data obtained through the data analysed [12]. For this qualitative research, grounded theory provides a step-by-step and systematic method for data analysis. Grounded theory begins with the approach of reading field notes repeatedly from finding, discovering, and exploring the relationships between basic variables to forming a grounded theory in the data collected and developed through an inductive process [13].

Data obtained from the original source (grounded) form this theory. Based on the proposed theory, data is collected, analysed, and validated. This theory is then refined based on data collection and analysis [14].

This process continues until a saturation point is reached. In this grounded theory, researchers collect experience and expertise about sources in a more systematic way, either directly or indirectly [15-16]. Collecting detailed experience allows researchers to identify individual data more accurately and formulate theories and concepts in an orderly and precise manner [14].

2. Methodology

This study employed a qualitative method, specifically in-depth semi-structured interviews with 21 informants—10 males and 11 females —categorised as adult customers aged 18 years and above,

as defined by the Adultthood Act 1971 (Act 2). In addition, this study used a purposeful sampling method, namely, informants must comply with the following characteristics: i) Have used the digital menu at least five times and above, ii) Be 18 years and above, and iii) Must be residing in the rural area in the seven districts in rural area Sabah, namely: *Beaufort, Kuala Penyu, Sipitang, Tenom, Keningau, Tambunan, and Nabawan*. A total of six questions were used as a guide, and there were several additional questions during the interview. This study has complied with interview standards, which initially require informants to sign an informed consent form to volunteer and participate in this study. During the interview, the informant's voice recording process was carried out to assist the researcher in identifying any points that might have been missed. After the interview, the researcher will transcribe the data and listen to the recording repeatedly to ensure that no points are missed.

All data were analysed with thematic analysis that formed several themes. Thematic analysis was used as a qualitative method to identify, analyse, describe, and organise themes in the data [17]. The goal of thematic analysis is not simply to summarise the content of the data but to identify and interpret the main characteristics of the data, guided by the research questions. This method is not only designed to identify all aspects of the data, but also to highlight the most important elements [17]. Thematic analysis also allows researchers to use a structured approach in data handling, producing a clear and organised final report [18]. However, themes are based on the research questions and data obtained from informants. The use of thematic analysis in research can be used for both large and small data sets, ranging from case studies of one to two participants to extensive interview studies involving 60 or more participants [17]. Therefore, using this thematic analysis is more helpful to the research data by organising themes based on the results of the transcription of informant data through interviews conducted. This research was conducted through ATLAS.ti to generate initial codes and was organised into meaningful categories aligned with the research objectives. After coding by ATLAS.ti, the themes were created, refined, and sorted in Microsoft Word.

3. Results

The results of the interviews and thematic analysis revealed that adult customers' perceptions of QR code digital menus can be categorised into two main themes: (i) Challenges of QR Code Digital Menus and (ii) Limitations of QR Code Digital Menus. The first theme, Challenges of QR Code Digital Menus, consists of four sub-themes: (i) Internet Connectivity Issues, (ii) Adaptation Difficulties, (iii) Time Consumption, and (iv) Loss of Personal Interaction (Figure 1). The second theme, Limitations of QR Code Digital Menus, comprises four sub-themes: (i) Dependence on Smartphones, (ii) Accessibility Limitations, (iii) Technical Reliability, and (iv) Privacy Concerns (Figure 2).

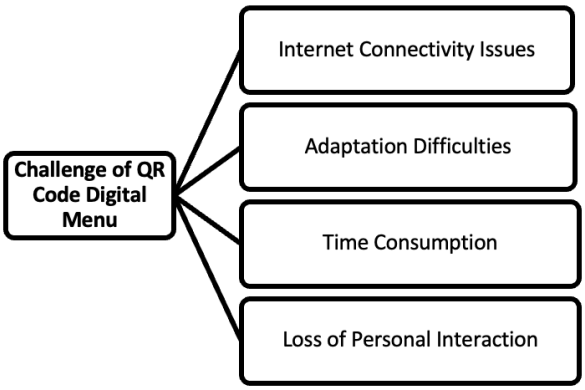

Fig. 1. Challenge of QR code digital menu

3.1 Challenges of QR Code Digital Menus

3.1.1 Internet connectivity issues

The issue of internet connectivity has emerged as one of the challenges in using QR code digital menus, particularly in rural Sabah. Unlike urban settings where stable internet is often taken for granted, informants frequently encounter unstable connections, slow page loading, or even complete service outages. These issues significantly disrupt the ordering process, making it difficult for informants to scan QR codes, access digital menus, or complete online transactions. Unstable connections often force informants to spend considerable time waiting for menus to load, which contradicts the intended purpose of digital menus as tools for convenience and efficiency. For many informants, this experience creates frustration and often compels them to revert to manual ordering or traditional menus. Environmental and infrastructural factors further compound this problem. Weather conditions, local terrain, and the availability of stable networks from telecommunication providers heavily influence Internet connectivity in rural Sabah. Although some restaurants provide Wi-Fi, these connections are sometimes intermittent and fail to connect. Moreover, unstable internet not only reduces the practicality of QR code digital menus but also creates a digital divide between urban and rural customers. Other informants also supported this finding:

> *"You know, in Sabah, especially in rural areas, the connection is sometimes bad, just loading and loading. It takes time. If you're lucky, you can scan and see the menu; if not, you need to order manually. So it's very hard to order" (IF4, 28 years old, Kuala Penyu).*

> *"There are a lot of issues when using QR code digital menus. One of them is the internet connection. You know the internet in rural Sabah is very bad, unlike in the city. If you want to use the digital menu, you need a strong and stable internet connection, or you have to use the restaurant's Wi-Fi to order" (IM11, 35 years old, Tenom).*
> *"Actually, we face difficulties scanning QR codes if the internet connection is not good. Sometimes it's good, sometimes it's bad, it depends on the weather and which telco is being used. Café Wi-Fi sometimes connects, sometimes it doesn't. It's very hard to order when that happens" (IM15, 33 years old, Keningau).*

3.1.2 Adaptation difficulties

For the sub-theme Adaptation Difficulties, several informants, particularly older adults known as Baby Boomers and Generation X, reported challenges in using smartphones and adapting to new digital systems. Many lacked sufficient knowledge of digital platforms, such as knowing which applications to download or how to use them effectively. Some informants did not know how to scan QR codes or complete food orders, which reflects the difficulties informants face in adapting to QR code digital menus due to differences in age, technological literacy, and device availability. For most informants from the mentioned generations, using smartphones to access menus was perceived as unfamiliar and insignificant to their dining experience. These customers were often less familiar with scanning QR codes, navigating mobile interfaces, or troubleshooting problems that arose during the process. This situation created discomfort and resistance, as they were more accustomed to traditional menus that did not require technical knowledge. Furthermore, customers with limited exposure to technology often lacked confidence and felt embarrassed when needing assistance from younger staff or family members to complete their orders. Similarly, another respondent added:

"The biggest challenge for me is lack of knowledge. I don't know how to scan QR codes or complete food orders. It's frustrating because the waiter in that restaurant didn't really help. I'm not literate in technology due to my age I feel too old to learn advanced technology anymore." (IM6, 50, Kuala Penyu).

"Sometimes I feel lack of confidence because my phone cannot function properly to scan QR codes. On top of that, I feel embarrassed when I have to keep asking younger café staff or family members to help me place my order." (IF14, 45, Keningau).

"I'm not familiar with scanning QR codes when ordering food. My son has taught me many times. Sometimes I manage to access the menu, but in the middle of ordering, problems occur. I panic, don't know what to do, and don't know how to troubleshoot the issues." (IF21, 48, Nabawan).

3.1.3 Time consumption

The use of QR code digital menus was found to be time-consuming, as informants often reported spending a considerable amount of time reading, selecting, and ordering food due to the numerous processes and sections on each page of the menu. Informants were also required to repeat this process for each family member dining together. Additionally, some customers expressed frustration with digital menus that required extra steps, such as downloading applications or registering personal information, which significantly increased waiting time. Consequently, QR code menus were perceived as time-consuming, inconvenient, and less practical than traditional menus, particularly in situations where efficiency and speed are expected. For families with young children, the digital menu further prolonged the ordering process, as parents had to navigate the interface while also assisting children who were unable to read, thereby slowing down the dining experience. Informants also perceived digital menus as taking longer to navigate compared to physical menus, as they often had to wait for pages to load. Another shared:

"I had an experience where, before ordering, I had to download the app or go to their website to register my email and all my information. It was really annoying. Guess how long it took me to do all that? Around 25 minutes. With a physical menu, we would have already gotten our food," (IF8, 27 years old, Sipitang).

"By using QR code its take time because starting from arriving at the food shop, we have to scan the QR on table, then scroll the menu one by one, if they have photos is bonus. We take at least 3 to 5 times repeatedly to review the menu. After that we add the menu to the cart, then select others menus and add them to the cart one by one. The process is keep repeating until all my family members finish. In addition, we confirm the menu and pay online or at the counter," (IF17, 26 years old, Tambunan).

"I have four children, most of them between the ages of one, three, five, and seven years old. Some of them can read the menu but they don't know how to order. Sometimes It takes longer compared to using a physical menu when ordering. I prefer the physical one because the children can share the menu," (IF5, 36 years old, Kuala Penyu).

3.1.4 Loss of personal interaction

The sub-theme Loss of Personal Interaction highlights that, informants preferred face-to-face service. Informants mentioned that using QR code digital menus reduces opportunities for social interaction and human connection. With traditional menus, interaction between customers and servers is typical, particularly when visiting a new café or exploring new menu items. Such interactions often involve asking about the menu, ingredients, potential allergens, taste, or popular recommendations chosen by other customers. However, the shift to QR code menus limits these opportunities for communication and social engagement. In addition, informants felt that the implementation of QR code menus reduced their trust in food choices, as they no longer received personalised recommendations from servers or café staff. For some informants who are comfortable and casual with customer service, seeing this digital menu directly is not friendly to them. Similarly, another respondent added:

> *"I personally like to interact with waiters. Normally, I ask a few questions regarding the food because I have a seafood allergy. I am afraid that they might put some dried shrimp in the dish. However, when using QR codes, some restaurants do not clearly mention food allergens or list all the ingredients," (IF13, 31 years old, Keningau).*

> *"If there is a new café, I always visit. Most new cafés use QR code digital menus, and it is difficult to know which dish is delicious. With a traditional menu, we can ask many questions about the taste, ingredients, and food recommendations. Sometimes the food pictures in digital menus look so tempting, but it is disappointing in reality," (IM19, 30 years old, Nabawan).*

> *"I feel frustrated when owners implement QR code digital menus because I do not fully trust the food options. With a physical menu, we can ask the waiter, and they will usually provide some suggestions about the food," (IM2, 29 years old, Beaufort).*

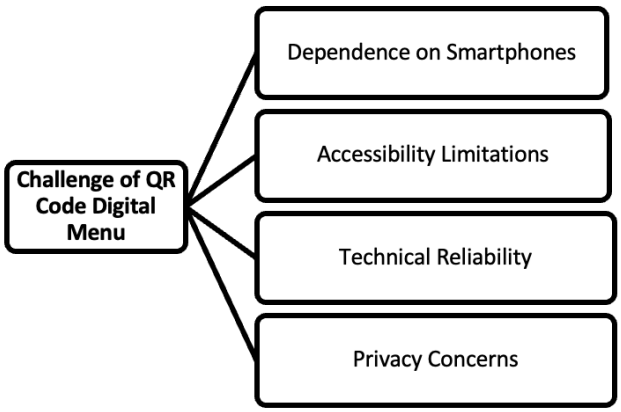

Fig. 2. Limitations of QR code digital menu

3.2 Limitations of QR Code Digital Menus

3.2.1 Dependence on smartphones

The difficulty of adapting to QR code digital menus was particularly evident among informants who were less technologically experienced. Older or elderly customers often struggled due to not owning a smartphone, using outdated models, or experiencing issues such as low battery and limited

storage capacity, which made it difficult for them to adapt and place food orders. Another barrier was related to smartphone ownership and functionality. Some informants reported that they did not own smartphones, relied on older devices, or faced frequent technical problems, all of which hindered their ability to use digital menus effectively. These limitations made it harder for them to adapt to the digital ordering system compared to the familiarity of traditional paper menus. In some cases, QR codes could not be scanned, and certain older smartphones were incompatible with the latest technology. Other informants also supported this finding:

> *"I think the major problem with QR codes is smartphones. For example, my parents' smartphones are outdated and always run out of battery. How can they use QR codes? They only use their phones for texting and calling. If I'm with them, of course, I will help them." (IW4, 38, Keningau).*

> *"I think sometimes this digital menu is not very practical. Once, my phone ran out of battery when I went to a shop to eat. They used a digital menu system, so I couldn't order, and they also couldn't take my order manually because everything had to go through the system. Normally, I just leave and look for another shop where I can order manually." (IM10, 47, Tenom).*

> *"I don't have the latest phone, so normally I use my son's phone to scan the QR code menu. I wait until my son comes back to our hometown, then we go to that café. If not, I just eat at a normal restaurant. I choose not to buy a new model because it's difficult, like needing to update the software and so on. I just want my life to be peaceful." (IM6, 50, Kuala Penyu).*

3.2.2 Accessibility limitations

Accessibility limitations represent one of the most critical barriers to the effective adoption of QR code digital menus among rural adult customers. The small text size and screen display often make it difficult for elderly or visually impaired customers to read. In some cases, the digital menu text is too small, presented in low visual quality, or lacks clear images of the food. Respondents also highlighted that the digital menus are sometimes challenging to navigate, with too many options displayed at once, insufficient explanations, and the need to concentrate on a small screen. In addition, several respondents mentioned that advertisements often appear before informants can place an order, which creates inconvenience and frustration. Among them were those who said:

> *"The digital menu displays very small text, especially when using a mobile phone. It is very difficult for older people like me. Even though you can zoom in, it is still uncomfortable to read. I am already old, and being both farsighted and nearsighted at the same time makes it quite difficult to see the digital menu." (IF16, 40, Tambunan).*

> *"The digital menu is quite complicated to use because there is not much information, and the images provided are sometimes unclear. As a new user, you have to learn and examine every corner of the digital menu system. Different QR code menus have different systems, and a lot of advertisements appear before we can order, so we have to wait." (IF9, 41, Sipitang).*

> *"Sometimes I face problems when scanning the QR code. The menu text is too small, and I cannot concentrate. I need to zoom in to make it clearer. I think the digital menu always*

confuses me and is difficult to use because the information is unclear and the design is complicated." (IM10, 47, Tenom).

3.2.3 Technical reliability

QR code menus are often vulnerable to glitches, app errors, and malfunctioning websites, making technical reliability one of the significant concerns raised by informants. In addition to adaptation difficulties, informants frequently encountered technical barriers when using QR code menus. Such problems included screen freezing, unstable internet connections, smartphone hangs, and digital menu software or websites that failed to function correctly, all of which disrupted the food ordering process. Furthermore, several informants expressed frustration when QR code systems redirected them to poorly designed websites or free third-party platforms cluttered with advertisements, which complicated the ordering process and negatively affected their overall dining experience. Similarly, another respondent added:

"The use of QR code digital menus is sometimes a bit difficult and confusing. Many restaurant owners use free software or apps to implement QR code ordering. When I scan, there are too many advertisements, and I have to wait 20 seconds or more. This is not really helpful because it wastes my time. With a physical menu, I can look and order straight away." (IM18, 38 yo, Tambunan).

"…The second issue is the website menu itself not running well, such as screen freezing and errors. We could not order the food, and even though we tried many times, it still did not function. We felt really frustrated because it wasted our time." (IF1, 44 yo, Beaufort).

"I often encounter technical barriers when using QR codes. For example, the digital menu software or websites sometimes fail to function properly, disrupting the food ordering process. Even if I try many times, it still cannot work because they use the free version. You know the free version is not stable." (IF20, 34 yo, Nabawan).

3.2.4 Privacy concerns

Privacy concerns emerged as a notable barrier to the adoption of QR code digital menus. Several platforms required customers to provide personal details, such as phone numbers, email addresses, or links to social media accounts, before they could access the menu or place an order. Many informants viewed this requirement as unnecessary and intrusive, particularly in casual or local dining settings where such information was not traditionally requested. The reliance on third-party applications or free hosting platforms further heightened these concerns, as customers feared the potential misuse of their personal data. Some expressed apprehension that their information might be shared with advertising companies or exploited for marketing purposes without their consent. This lack of transparency contributed to reduced trust in QR code systems. Other informants also supported this finding:

"I see scanning the QR code on the food menu as a privacy threat. The reason is that it goes through a third-party service and requires us to register an account. Sometimes the digital menu website asks customers to provide personal information, such as phone numbers,

identity card numbers, addresses, jobs, and more. I worry that all the information or data we share might be manipulated or misused by third parties." (IM2, 29 yo, Beaufort)

"When we scan the QR code, they ask us to fill in personal details like full name, email, and mobile number. We are really afraid they might use our personal information and sell it to advertising companies or other businesses for their own purposes. This makes the QR code system feel less transparent." (IM7, 33 yo, Sipitang)

"Some QR codes require me to register my details before ordering. I think this is unnecessary and interrupts the ordering process. I'm also worried that when third-party apps or free platforms are used, they might steal my personal data." (IM12, 28 yo, Tenom)

3.3 Discussion

This study identified two main themes: (i) Challenges of QR Code Digital Menus and (ii) Limitations of QR Code Digital Menus, each consisting of four sub-themes. The findings highlight that customers face both challenges and limitations when using QR code digital menus. One key issue is that businesses should also provide physical menus, as QR-coded menus may not be suitable for everyone for various reasons. Poorly managed ordering services can negatively affect customer satisfaction in the food purchasing process [19].

The constraints identified in the study reflect the perceptions of adult customers, showing that the themes are significant for further discussion. As argued by [3], most customers prefer physical menus over digital ones because they are more user-friendly and allow the entire menu to be viewed at once, rather than navigating multiple sections. Digital menus can be challenging to navigate due to excessive options, small screens, and complicated layouts [20]. In addition, digital menus may contain inaccurate or outdated descriptions, poorly displayed text, and even pose privacy risks.

Adaptation and technical issues also emerged as significant concerns. Some customers, particularly older adults, struggled due to not owning smartphones, relying on outdated devices, or facing issues such as low battery, which hindered their ability to adapt and place orders [21]. Moreover, digital menus are often prone to technical disruptions, including screen freezing, unstable internet connections, smartphone malfunctions, and software or website failures, all of which interrupt the food ordering process. It underscores the importance of considering customer perceptions when improving digital ordering systems [22].

Furthermore, customers reported that digital menus are time-consuming, requiring considerable effort to read, select, and order food due to the numerous steps and sections on each page. The process became even more prolonged when customers had to repeat it for each family member dining with them [11].

Finally, two-way communication remains an essential aspect of the dining experience. QR code digital menus were often perceived as ineffective because they reduce direct customer–employee interaction. Some customers viewed their use negatively for limiting opportunities to ask questions or receive recommendations, while others emphasised the potential vulnerabilities associated with these systems [10].

3.4 Recommendation

This study recommends that the government and NGOs prioritise ensuring reliable high-speed internet access in rural areas, as well as developing or monitoring secure digital menu applications

to protect customer data from misuse. Standardising a safe and uniform digital menu system would help strengthen customer trust and reduce privacy concerns.

For businesses, it is recommended that digital menus be implemented in a hybrid manner alongside traditional menus, allowing customers, particularly older adults, to choose based on their comfort and familiarity. Businesses should also provide free Wi-Fi access to support customers in scanning and using QR-coded menus more effectively. These measures can directly enhance the customer experience and reduce frustration associated with technical barriers.

From an academic perspective, future studies should be conducted on a larger scale across Malaysia, with a longer study period and a greater number of informants. Employing a mixed-methods approach that combines both quantitative and qualitative techniques would also provide a more comprehensive understanding of customer perceptions and the challenges of digital menu adoption.

4. Conclusions

In conclusion, the adoption of QR code digital menus has elicited mixed perceptions among adult customers, with both notable benefits and evident drawbacks. On one hand, these menus can streamline the ordering process, reduce queues, facilitate faster service, and support efficient payment methods, positioning them as an innovative tool in modern food service management. They also offer cost efficiency and enable businesses to communicate product information and promotional messages more dynamically.

On the other hand, the findings of this study highlight several challenges and limitations that affect customers' experiences. Challenges such as internet connectivity issues, time-consuming navigation, and the loss of personal interaction with staff often reduce the perceived convenience of digital menus. Limitations, including reliance on smartphones, accessibility difficulties, technical reliability problems, and privacy concerns, further restrict their effectiveness, especially among older adults and customers in rural areas.

Therefore, while QR code digital menus represent a valuable technological advancement, their implementation requires careful consideration of customer diversity in terms of age, digital literacy, and internet accessibility. Hybrid systems that integrate both physical and digital menus, along with improvements in design, reliability, and security, are necessary to ensure that digital menus provide a practical, inclusive, and meaningful dining experience.

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