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The QR Code Solutions (QRS) adoption Merchants experience - comprehensive generative literature review

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Abstract

This paper seeks to investigate the factors impacting the adoption of QR code based FinTech solutions within the United Kingdom's restaurant sector. Through three stage comprehensive literature, the findings generated a conceptual framework with factors affecting QR code adoption offering direction for the pilot, main study and initial practical guidance to researchers on FinTech adoption in restaurant. The generative review provided direction for a novel integrated TAM and TOE conceptual framework to support understanding merchant's perspective of the drivers and barriers for QRS adoption in UK restaurants.

Keywords: Generative Literature Review, QR Code Solutions (QRS), FinTech adoption, QRS

1.1 QR Code Solution- FinTech tool adopted in restaurants

The term FinTech encapsulates the synergistic relationship between finance, technology, and innovation, arising from the combination of "finance" and "technology" terms to illustrate technological progress in the financial industry (Kim et al., 2016). Referring to technology-driven financial services (Arner, 2019), has been viewed as a significant force in altering consumer behaviors (Barberis, 2016). In fact, one example of FinTech solution which completely changed behaviors with a QR Code feature is the QR Code Solutions (QRS) currently widely used in UK restaurants, surged post-pandemic with NHS Track and Trace scanning in the restaurants as starting point which changed customer behavior as resulted improved experience. QRS are the FinTech tools used for enhancing customer experience (Ozturkcan and Kitapci, 2023). The literature defined QRS adoption concept as technology, rather than encompassing the business managerial scope of the business side (Bressanelli et al., 2018, Lee and Shin, 2020)(Nuseir, 2021).

Many scholars have investigated the FinTech phenomenon and his passing evolution, however, for the anticipation of knowledge on emerging trends on QRS topic but furthermore understanding is essential in regards with the business adopting effects (Martin, 2010). There are several studies that have reviewed the adoption of QRS regarding sustainability impact of the QRS e-menus (Iskender et al., 2022, Iamkovaia et al., 2019) or on the ordering and payment processing topic (Ozturkcan and Kitapci, 2023). The ongoing developments of technology in the restaurant industry have made researchers more conscious of the necessity of understanding the process, rationalising the importance of adoption as a key technology for ensuring positive outcomes (Cañas et al., 2021). The progress of QRS adoption had been expressed as a complex business endeavor and previous recommendations demanded in-depth understanding of the QRS phenomenon (Mondego and Gide, 2018, Ashrafi and Easmin, 2023) and the limitations of knowledge has been flagged by main topic authors (Liébana-Cabanillas et al., 2019, Yan et al., 2021). The lack of studies from restaurants has been pointed out by recent statistics(Statistics, 2024, Yan et al., 2021).

One of the earlier reviews on mobile payment in the field of electronic payments between 2013 to 2020 by Mondego and Gide (2018) explained that only four studies have been conducted with a focus on merchants. Furthermore, another study by Li (2018) concluded that very few studies addressed the intentions of merchants to adopt QR code solutions and identified a clear knowledge gap in this area. However, focusing only on consumer experience with limited insight from the merchant's experience indicates that there is still an inadequate systemic understanding of this new form of service adoption (Suo, 2019) and overall, lack of complete understanding of QRS as FinTech restaurant tool.

1.2 Comprehensive Generative Literature Review (GLR)

This study utilised a comprehensive systematic literature review providing at each stage a transparent and annually updated compilation of current research analysis on QRS adoption. A systematic three-stage literature review with critical analysis constitutes the foundation of the main research and underpins the development of the conceptual framework tested at stage 4, pilot stage.

The study literature review is composed of three comprehensive systematic literature reviews (SLR) which revealed the gap, pro-consumer-centric literature, and the lack of understanding on the business side- the merchants. *Merchant* refers to an individual or business entity that sells goods or services, or commodities to consumers B2C or other businesses B2B. Merchants can operate through various channels, such as physical stores, online by e-commerce platforms, or B2B (business-to-business) transactions, and play a crucial role in the commerce ecosystem by facilitating the exchange of goods and services in the market, as they will sell products for a profit and facilitate the customer's buying journey (Bethencourt and Antunes, 2022)

The three stages review, namely SLR (2022-2023), GLR stage (2023-2024) and the updated literature review- GLR (2024-2025) are shown in Figure 1. and the results generated the conceptual framework for the Pilot study.

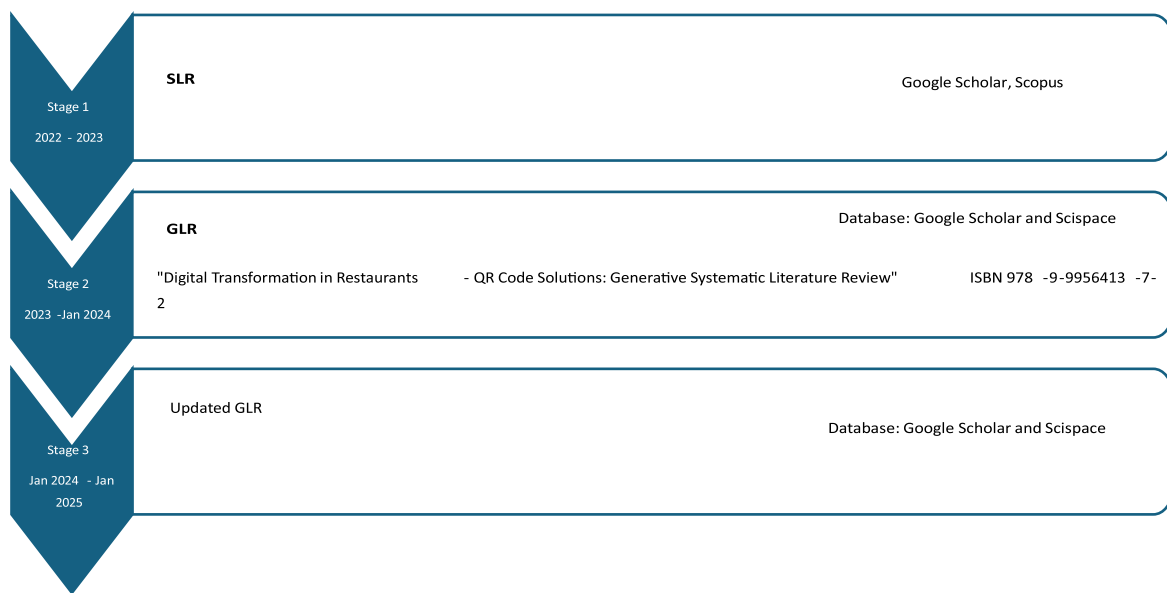


Figure 1 Systematic Literature Review before generating PILOT

For stage three, we enrich the databases using SciSpace for further accessing “grey literature”, conference papers, articles, book chapters and the findings still showed that the current literature focus is on consumers, with the remaining QRS adoption gap from merchants’ perspective. Table 1 presents the Scispace findings with details of method and results.

Title	Journal	Date	Methods Used	Results	Consumer or Merchants Study
The Role of QR Code Applications in Enhancing Customer Satisfaction at Restaurants: A Conceptual Study	Asian Journal of Research in Education and Social Sciences	31 st August 2024	Review of existing literature and research studies.	QR codes enhance customer satisfaction in restaurants. Study identifies usefulness, acceptability, and feasibility as critical elements.	Consumer
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	August 2024	Online questionnaires collected data from 299 respondents.	QR codes significantly influence purchase decisions, especially for younger customers. Ease of menu access enhances customer experience and purchase intention.	Consumer
. Tinjauan Sosiologis Difusi Inovasi QR Code Dalam Menu Makanan dan Minuman Pada Restoran Maupun Kafe di Panjer, Denpasar Selatan		18 th June 2024	Qualitative approach with descriptiveexplanatory type. Analysis based on diffusion of innovation theory.	QR Code innovation received positive consumer responses in Denpasar. Some consumers faced challenges with QR Code usage.	Consumer
Pendampingan Digitalisasi Teknologi Melalui Menu QR Code di Mango Taru Restaurant & Bar	International Journal of Research Publication and Reviews		Qualitative approach with interviews and observations. Document analysis for implementing QR Code technology.	Improved service efficiency and reduced customer waiting time. Enhanced restaurant's image as innovative and environmentally friendly.	Merchant
An Innovative Kot Ordering System for Restaurants	International Journal for Science Technology And Engineering	31 st May 2024		Reduces errors and enhances service efficiency . Provides real-time oversight and sales data visualization.	Merchant
QR Based Food Ordering System including Sentimental Analysis	International Journal for Research in Applied Science and Engineering Technology	30 th April 2024		Simplifies food ordering and streamlines business operations. Enhances customer experience with personalized menu suggestions.	Merchant
QR-based Canteen Management System	Journal of Information Technology and Digital World	1 st September 2024		Automates order processing, payment, and sales record maintenance. Streamlines canteen operations, reduces service time, and improves customer satisfaction .	Merchant

Implementasi QR Code Untuk Sistem Informasi Pemesanan Menu Pada Restoran Omah Gedhe	Artificial Journal Intelligence and Multimedia Informatics in	26 November 2024		he results of this implementation show that the QR Code-based information system can	Merchant
Pandean Kaliwungu Berbasis Web				improve service speed, reduce ordering errors, and provide more interactive experience for customers.	
Deciphering the dilemma: The surprising impact of QR code menus on diminishing customer loyalty		December 2024	111 study 1 297 study 2	Indicate that <i>menu technology</i> could have negative consequences. Despite numerous cost and time benefits, QR code menus backfire and reduce customer loyalty.	Consumer
The Role of QR Code Applications in Enhancing Customer Satisfaction at Restaurants : A Conceptual Study	(Zakri et al., 2024) Future Horizons: Challenges and Opportunities in Global Hospitality and Tourism /				Consumer

Table 1 GLR 3rd stage - Scispace findings

By problematising the context, this study aims to move from the isolated consumer perspective of the phenomenon to a deeper understanding of the QRS adoption phenomena (Alvesson and Sandberg, 2011, Alvesson and Sandberg, 2020). Understanding the business side, bringing new methods for analysing the phenomena with the aim of understanding the QRS adoption drivers and barriers.

Considering the economic importance of restaurants within the UK and the integral part merchants play in FinTech QRS adoption, businesses need to adopt a strategic approach to technology to ensure market competitiveness. Furthermore, the utilization of technology has been extensively studied by several researchers((Nkhoma et al., 2013, Chuang et al., 2014) contributing to the development of theoretical frameworks that focus on various factors and advantages (Gangwar, 2018, Raymond and Uwizeyemungu, 2007, Gounaris and Koritos, 2008).

The implementation of QRS in restaurants has impacted customer satisfaction (Hossain et al., 2019), reducing business cost and improved service efficiency (Intal et al., 2020). From usability (Mendocilla et al., 2021), safety (Das et al., 2021) or perceived risk (Sahi et al., 2021) consumers seek effectiveness and efficiency in payments. Payment is an operational facilitator system where contracts and agreements use tech for delivering/receiving payment obligations through the value exchanged in a full ecosystem with players, including individuals, banks, acquirers and other institutions (Sucipto et al., 2022).

The QRS adoption has significantly transformed business operational efficiency and customer experience. FinTech facilitates instant contactless ordering and payment processes, enhancing customer satisfaction and streamlining restaurant operations.

1.3 QR Code Solutions (QRS) adoption - FinTech adoption drivers and barriers

Some recent studies have been conducted on the adoption of QRS Fintech solutions in restaurants and showed as determining adoption factors the customer satisfaction (Zakri et al., 2024) based on the instant access of the e-menu, and the enablement of ordering and paying, the ease of use and convenience especially in the younger consumers perception (Mazhar et al., 2024); the operational efficiency as QRS automation support reducing human error in ordering and in the billing accuracy (Chong, 2023) with whole instant process of order/pay being crucial for some restaurants (Raja Kamal et al., 2022).

Several researchers conducted studies to determine the QRS barriers, namely connectivity or consumer lack of familiarity which can affect customer journey (Rasmi et al., 2024) including customer perception of QRS adaptability and the importance of understanding to enhance the Fintech full benefits (Mazhar et al., 2024). However, limited research exists about the business awareness of the adoption implications. In other words, researchers are more concerned about consumers adoption, while merchants' adoptions, their business operational applicability of QRS adoption has been less researched.

Comparative Analysis Traditional POS vs QRS

A comparative discussion between the traditional POS (point of sale) ordering system and the QRS can be conducted to highlight their differences. The following table 2 shows the comparison between traditional and FinTech adoption in restaurants.

Traditional POS in restaurant		FinTech – QRS
Manual printed menu	MENU	E-menu
Waiting time for ordering	ORDER	Instant ordering
Inefficient communication- human errors	ORDER	Ordering process directed to kitchen
Waiting time for payment	PAYMENT	Instant payment
Limited Data	DATA	Consumer data insights analysis

Table 2 Comparative traditional POS vs QRS

Although QR codes provide considerable benefits, their efficacy is sometimes constrained by technological limitations affecting specific user groups, thus necessitating inclusive implementation strategies.

2. GLR: Development of a Conceptual Framework for analyzing QRS Adoption Drivers and Barriers in the Restaurant Industry

Furthermore, the literature review findings generated the direction of novel theory, expanding knowledge further than the predominant FinTech adoption theories TAM, UTAT, utilising a theory matching the context and the focus on the business player measuring merchants' perspective involving integrated variable to ensure understanding of QRS Adoption drivers and barriers from the business perspective.

The implementation of digital solutions applications often proved challenging for businesses due to limited experience and resources. Nevertheless, scholarly inquiry has used adoption models to understand FinTech Adoption implications. Relevant models include the Technology Acceptance Model (TAM) (Davis, 1986), TAM2 (Venkatesh and Davis, 2000), the Theory of Reasoned Action (Ajzen and Fishbein, 1988), the Theory of Planned Behaviour (TPB) (Ajzen, 1991), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003), Innovation Diffusion Theory (Rogers et al., 2014), the Technology-Organization-Environment (T-O-E) framework (Tornatzky, 1990). Although, some of these models/theories allow drivers and barriers adoption classification and the ability to identify causality they don't ensure knowledge of QRS complex analysis of observed adoption level (Newman and Robey, 1992) and have been criticised of losing the detailed process (Nolan, 1973) of adoption implications.

With the increased dependence of technology to change restaurant operations, determining the key drivers and barriers is a critical concern for business success. Workplace innovation is predicated on the initial acceptance of technology by its users (Teo, 2012). For the inquiries of technology acceptance, the Technology acceptance model (TAM) and the theory of reason action (TRA) have both been used to study factors of impacted technology usage intentions. One of the latest tech study of (Martín Martín et al., 2022) showing business type, location and staff experience as determinants of tech adoption in restaurants which will be used as factors for the research pilot stage.

Limited inquiries moved from techno-economic, utilitarian, attitudinal determinants context of TAM, TRA and for behavior, more specifically TBP (Ajzen, 1991) incorporating mixed parameters. The shortfalls of the prior studies are the clarification of the factors and due to contradictions, the practicability is reduced. The UTAUT model also gained popularity, showing finding diverse applicability of FinTech applications such as mobile payments, Robo-advisors and cryptocurrency studies.

A recent FinTech systematic theory used analysis (Vasishta et al., 2024) showed 63 % dominance of TAM and UTAUT in FinTech adoption research. The importance of understanding the forces promoting and impeding the uptake of QRS systems by merchants must be emphasized within the context of recent developments.

Limitations of the Technology Acceptance Model (TAM) framework, stemming from its exclusive focus on technology and resulting in an inadequate explanation of the phenomenon, have been highlighted (Venkatesh and Davis, 2000). Conversely, recent FinTech adoption studies posit the Technology-Organization-Environment (T-O-E) framework as the preferred, validated, and robust framework for organizational-level analysis (Gangwar, 2018).

2.1 The adoption of FinTech QRS) in restaurants will be examined using a combined Technology Acceptance Model (TAM) and Technology-Organization-Environment (T-O-E) framework

As scholars called for more holistic integrated framework to focus on the organisation adoption implacability, therefore, the next steps of the research, the stage 4 Pilot and the main study will further investigate and will be contributing on the sector-specific characteristics, the FinTech adoption in restaurant, since there are limited studies that use the T-O-E and TAM frameworks for restaurant merchant's adoption determinants drivers and barriers of QRS.

The existing theoretical frameworks of TAM and TOE, while insightful individually, lack the necessary explanatory power to comprehensively address the phenomenon of QR code adoption in the restaurant industry with business focus.

After thorough analysis of existing literature, the preceding factors were systematically classified into the following key dimensions: individual, technological, organisational, and environmental using T-O-E framework. This categorisation offers a solid framework for evaluating the merchant adoption experience of FinTech services.

The TOE framework comprises technological advancement, organizational restructuring, and environmental impact assessment. The current era of rapid digitalization and its focus on economic knowledge have transformed information into a critical competitive asset. Consequently, businesses actively seek cost-effective and efficient solutions to streamline operations and enhance support. T-O-E has been seen as a standalone framework to investigate socio-economic elements alongside the organisational, technological forces adoption shaping the adoption through transformation. The T-O-E framework was developed to identify and predict innovation adoption, highlighting technology development as a key factor (Kauffman and Walden, 2001) influenced by business reconfiguration and industry environment (Chatterjee et al., 2002). Technology adoption is influenced by internal and external drivers and barriers as per SLR perceived usefulness, compatibility, complexity and visibility (Awa and Ojiabo, 2016)

Technology

Complexity refers to the difficulty level of understanding in using a new technology (Sonnenwald et al., 2001). Complexity is also defined as the time consumed to execute the tasks, system features and functionalities, and system's third parties' interfaces design (Gangwar, 2018). The possibilities of innovation adoption are low, if the innovation is difficult to be performed (Rogers et al., 2014). The technologies should be easier to manage, easier to use, and user friendly (Berman, 2016). Complexity is the technological factor which the level of innovation is viewed as hard to understand and implement (Salah et al., 2021).

A recent study of (Martín Martín et al., 2022), identified factors that influence adoption of FinTech solutions in the restaurant industry, concluding that the digitalisation of business is related to management educational leverage, the business size and location factors which were used also in the *pilot stage* as participants variables for QRS adoption in UK restaurants.

Organisational

Size

The current literature is stating that the scale of an organization is a key determinant for technology adoption (Melo et al., 2021), impacting directly the innovation adoption (Jeyaraj et al., 2006), with the larger organisation having a higher adoption intention and smaller size showing a lower intention to adopt new technology innovations (Setiyani and Rostiani, 2021). Alternatively, the existing body of research presents conflicting findings; a recent study found no significant correlation between organizational size and innovation adoption (Goode and Stevens, 2000).

Consequently, in the next stage, the pilot study will investigate the impact of restaurant size, differentiating between SMEs and chains, on the adoption of the QRS.

Geographical Location

Additionally, one of the technologies adoption factors has been classified as the geographical factor with some recent data showing the cross-country differences in the scale of fintech adoption are crucial, noting the rural/ tourist area influence on the adoption; furthermore, recent studies mentioning the importance role in supporting rural areas to adopt technology to ensure industry competitiveness (Su et al., 2024).

Environmental

Restaurant Competitive Industry

The implementation of new technologies can be challenged by environmental variables and uncertainty (Effendi et al., 2020). A competitive industrial landscape fosters a greater propensity for innovation adoption.

As per generative literature review principle (Gruner and Minunno, 2024) this study systematic literature reviews findings have been used to direct the proposed Conceptual Framework for QRS Adoption in restaurants within integrated TAM and T-O-E as in figure 1. The conceptual framework has been constructed by combining key elements of TAM and T-O-E theories to be specific to the restaurant FinTech adoption, to support this research objective, *identifying drivers and barriers of QRS adoption for UK restaurants*.

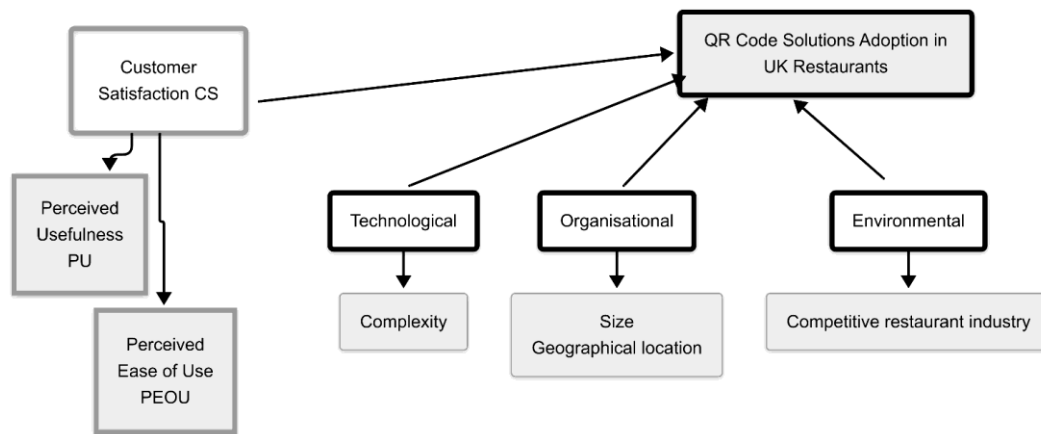


Figure 1 Source : Prepared by author: Perceived Customer Satisfaction Factors and Technological, Organisational, Environmental Factors Influencing the Adoption of QR Code Solutions by merchants' restaurants in United Kingdom

Based on the TAM and TOE frameworks the QRS adoption factors were systematically categorized into four core dimensions: user motivation and attitude, technological factors, organizational factors, and environmental factors. This categorisation provides a robust foundation for analysing the merchant adoption perspective of FinTech services. Innovations also bring the risk of failure, and all these factors can be a key distinguishing factor for business survival and growth. The research scope is to address a significant knowledge gap by extending QRS adoption knowledge from restaurants experience, furthermore, expanding the pilot and main study through the lens of a TAM-TOE integrated framework.

It is understood that in the global knowledge economy, FinTech is the way forward for conducting business and it is well known that businesses are the pillar of the emerging economy (Kuan and Chau, 2001). As per GLR findings, the literature for FinTech adoption is TAM or UTAUT predominantly focused and the TOE & TAM comes as an alternative after the study reflective critical analysis as per (Alvesson and Sandberg, 2020).

In summary, the analysis of the literature on the QRS adoption post -pandemic highlighted the need for a critical assessment of theoretical frameworks used in research (López-Nicolás et al., 2008, Alvesson and Sandberg, 2020) and by integrating novel determinants from TOE & TAM, the study aim to gain a more comprehensive understanding of the of QRS adoption in restaurant settings.

CONCLUSION

FinTech adoption is central focus to financial, business and management scholars. Despite the long tradition of research on the topic of QRS, this study uncovers inconsistencies among existing studies, a strong focus on consumers, constructs of consumer factors, and the same Fintech theories without considering the new context. This study contribution to the literature is twofold. First, we produce a comprehensive analysis of the literature that will serve as a guide to next stage of pilot and main study. Second, we produce a conceptual framework on the emerging topic of QRS adoption in restaurants. As our analysis shows, QRS adoption literature is gaining momentum with insufficient awareness of the unique business phenomenon in Uk restaurants and in many cases is presented as trend but with no further adoption barriers and challenges as business analysis. Failure

to understand the phenomenon may cause scholars to overlook a significant opportunity to comprehend how QRS is influencing the restaurant industry and how it can be leveraged as a competitive advantage in today's competitive landscape.

This study conceptual framework and future research directions (Pilot and main study) aim to stimulate a robust and novel debate in the topic research area. Following the SLR and the guidance for generative literature review, the direction of the new work research will bring a comprehensive qualitative focus on in-depth semi-structured interviews with restaurant managers who already adopted QRS to understand the impact of adoption from their own perspectives.

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