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QR code payment technology in university commercial restaurants: Analyzing student perceptions of usefulness, ease, and trust

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Abstract

This study examines key determinants influencing students' adoption of QR code payment systems in campus dining contexts, addressing the limited research on technology acceptance in such settings. The objective was to assess the roles of perceived usefulness, ease of use, and trust in shaping willingness to adopt these systems. Data were collected from 161 students who regularly use QR code payments through a structured questionnaire. Findings indicate that perceived usefulness and ease of use are the primary drivers of adoption, reflecting the importance of practicality, efficiency, and user-friendly design. While trust exerted less direct influence, it remained relevant due to concerns over security and privacy. Beyond facilitating transactions, the integration of such payment systems was observed to contribute to a more modern and technology-enriched campus environment. The study provides insights into optimizing payment technologies to enhance student experiences and support the evolution of digitally responsive educational spaces.

Keywords: Digital adoption; ease of use; payment technology; perceived usefulness; trust.

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1. INTRODUCTION

The twenty-first century places significant demands on the capacity to interact with information and communication technologies and an individual's ability to interpret the vast influx of information and assess its relevance, integrity, and usability (Křeménková et al., 2021). Despite the growing prevalence of QR Code Payment methods, there is a gap in understanding how students in Commercial Restaurants perceive the usefulness, ease of use, and trust associated with this technology (Liu & Chen, 2022; Smith & Johnson, 2023; Yamin & Abdalatif, 2024). This research seeks to address this gap and shed light on the factors influencing students' attitudes toward adopting QR Code Payment methods, contributing to the current discourse on technology adoption in educational settings (Wang & Chen, 2022). Research in emerging markets shows that factors like perceived usefulness, ease of use, perceived security, and social norms play a major role in shaping people's intention to use QR code payments, frequently with attitude acting as a mediator (Ngo & Nguyen, 2021)

Indeed, educational organizations possess specific professional knowledge and skills that differentiate them from others. Technology enables management and teaching applications in professional development (Kanbul & Guldal, 2019). In recent years, the integration of technological advancements in educational settings has become increasingly prevalent. This study delves into the specific context of student responsiveness to QR Code Payment within Commercial Restaurants. The primary objectives are to evaluate perceived usefulness, ease of use, and trust as determinants of students' attitudes toward adopting QR Code Payment methods.

Technology integration within educational environments has seen considerable evolution, particularly with the advent and increased adoption of innovative technologies that reshape student interactions and transactions (Khumalo & Baloyi, 2018). Among these, QR Code Payment methods have emerged as a significant development, offering a seamless and contactless transaction mechanism (Liu & Chen, 2022; Smith & Johnson, 2023; Chen & Li, 2024). Despite widespread adoption, there remains a discernible lack of empirical research concerning students' perceptions of University Commercial Restaurants regarding the usefulness, ease of use, and trustworthiness of QR Code Payment systems. This study aims to address this research gap by examining the specific attitudes of students towards QR Code Payment technology within the context of University Commercial Restaurants.

This research is predicated on the hypothesis that understanding the nuances of technology acceptance among students is crucial for fostering more effective integrations in educational settings. According to Wang & Chen (2022) and Kim et al. (2021), as digital financial transactions become more prevalent, comprehending how students, as primary users in educational sectors, adapt to and accept these technologies is vital. Further, during the COVID-19 pandemic context, QR code mobile payments' perceived utilitarian and health benefits and social influence markedly shaped adoption behavior (Tu et al., 2022; Ponsree, 2024). This study will, therefore, focus on the perceived usefulness, ease of use, and trust as pivotal factors influencing students' adoption of QR Code Payments.

1.1 *Literature review*

1.1.1 Overview of QR code payment technology

The adoption of smartphones and the widespread availability of camera-equipped mobile devices played a pivotal role in popularizing QR Code Payment technology. Consumers can now use their smartphones to scan QR codes, initiating seamless and secure financial transactions. The evolution of QR Code Payment technology has been marked by its adaptability to various industries (Liu & Chen, 2022). Initially embraced by the retail and hospitality sectors, QR codes are ubiquitous in transportation, entertainment, and service-oriented businesses (Zhang & Liu, 2023). This versatility has led to the integration of QR Code Payment into everyday activities, offering users a fast, contactless payment method.

QR Code Payment technology finds diverse applications across various contexts, revolutionizing traditional transaction methods. In retail and commercial spaces, it facilitates swift and secure transactions, diminishing

the reliance on conventional payment methods and streamlining the checkout process for consumers and businesses. QR codes are extensively employed within the hospitality industry, particularly in restaurants and cafes. They empower customers to effortlessly peruse menus, place orders, and make payments using smartphones, elevating the overall dining experience (Eren, 2022; Nguyen & Alang, 2024).

In transportation, QR Code Payment has reshaped how people pay for services. From ticketing at metro stations to fare payments in ride-sharing services, QR codes have become commonplace, offering a convenient and efficient means of financial transactions (Yang & Zhang, 2024). Online retailers have also embraced QR Code Payment as a viable alternative to traditional payment gateways, ensuring a secure and seamless method for completing transactions in e-commerce. Moreover, the reach of QR Code Payment technology extends to educational settings, where it is progressively making inroads. In classrooms and campus environments, QR Code Payment provides students with a convenient avenue to make payments for various services, events, or materials, aligning with the broader trend of technological integration in education.

1.1.2 Integration in educational settings

Integrating QR Code Payment technology in educational settings seamlessly aligns with the broader trend of digitization that has become increasingly prevalent within academic institutions. This strategic incorporation of QR Code Payment into the educational landscape extends beyond mere financial transactions. It encompasses a spectrum of applications, ranging from managing tuition payments to facilitating event registrations and various other economic interactions within the educational sector (Kim et al., 2021).

Moreover, QR Code Payment technology proves invaluable in event registrations within educational institutions. QR Code Payment methods facilitate seamless registration for academic conferences, workshops, or extracurricular activities (Li & Zhang, 2024). Attendees can effortlessly register and make necessary payments, while event organizers benefit from this digital solution's enhanced efficiency and accuracy.

As educational institutions actively seek to embrace technological advancements to meet the evolving needs of their stakeholders, the adoption of QR Code Payment reflects a steadfast commitment to enhancing convenience and accessibility (Wu & Chen, 2023). The integration of this technology not only aligns with the modernization goals of academic institutions but also underscores a dedication to providing a contemporary and efficient ecosystem for both students and faculty members. It represents a forward-thinking approach to financial transactions within the educational sector, fostering an environment where technology enhances operational efficiency and positively impacts the overall experience of the academic community (Zhang & Liu, 2023).

1.1.3 Technology adoption theories

The Technology Acceptance Model (TAM), proposed by Davis (1989), posits that perceived ease of use and perceived usefulness are fundamental determinants of an individual's intention to use technology (Legris et al., 2003). In recent research, scholars have continued to explore TAM's applicability in various contexts, including the adoption of technology in the hospitality industry. For instance, studies have examined the factors influencing consumers' acceptance of mobile payment technologies, such as QR code payments, in commercial settings like restaurants (Kim et al., 2021; Yu & Fang, 2023).

Applying these theories becomes particularly pertinent in a restaurant commercial class, where practical skills and real-world scenarios are emphasized. Students' acceptance of QR Code Payment can be influenced by their perceptions of how easily they can incorporate it into their restaurant management tasks. The diffusion of QR Code Payment technology may depend on how students observe its advantages and practical applications in restaurant operations (Venkatesh & Bala, 2008). Additionally, the unified approach of UTAUT allows us to consider the broader socio-technical context within the classroom, where social influences and facilitating conditions play a crucial role in shaping students' responsiveness to QR Code Payment.

By leveraging these theories, educators and researchers can gain a nuanced understanding of the factors influencing student responsiveness to QR Code Payment technology in commercial restaurants. This insight can inform strategies to enhance adoption and integration, aligning technological advancements with the specific needs and dynamics of the educational context.

1.1.4 Perceived usefulness in educational technology adoption

Perceived usefulness is a fundamental construct in technology adoption models, describing an individual's subjective belief in the extent to which a specific technology will enhance their performance or facilitate the completion of tasks (Davis, 1989). In educational environments, this construct extends to students' perceptions regarding how technology, such as QR Code Payment systems, contributes to their learning outcomes, efficiency, and overall educational experience.

Students assess the utility of technology based on its tangible benefits within their educational context (Chan & Li, 2010). For example, in commercial restaurants within a university, students might consider how QR Code Payment helps streamline financial transactions, enhances their comprehension of modern payment technologies, or provides practical experience relevant to their studies in the hospitality industry. The perceived usefulness of QR Code Payment systems in such settings transcends mere convenience, intertwining with its educational value and the technology's role in skill development.

Research has consistently shown that perceived usefulness is a potent predictor of technology adoption in educational settings (Al-Adwan & Al-Adwan, 2013; Al-Gahtani, 2016; Teo & Noyes, 2011). This notion encompasses not only the practical benefits of a technology but also its educational value, aligning with students' specific learning needs and objectives. Whether in commercial restaurants or other educational contexts, understanding how students perceive the utility of QR Code Payment systems is crucial for devising strategies that enhance their adoption and integration into educational experiences.

Adding to this understanding, the significant impact of perceived usefulness on the adoption of QR code systems underscores that students place a high value on tangible benefits (Venkatesh & Davis, 2000). To amplify these benefits, it is recommended that educational institutions introduce incentives such as discounts, cashback offers, or loyalty rewards. These incentives not only reinforce the perceived advantages but also provide tangible rewards that encourage ongoing use and engagement with the technology (Kim et al., 2021).

1.1.5 Ease of use in educational technology

The concept of ease of use is critical in educational technology as it directly influences students' acceptance and engagement with technological tools. Ease of use refers to the perceived simplicity and user-friendliness of a technology, which significantly impacts how seamlessly students can engage with and integrate it into their educational activities (Davis, 1989). In contexts like commercial restaurants within educational settings, the user-friendliness of QR Code Payment systems is instrumental in their adoption.

Ease of use is essential for fostering students' confidence in utilizing new technologies. A system that students perceive as easy to use encourages them to engage more actively and explore its features more thoroughly (Legris et al., 2003). As students become more comfortable with QR Code Payment systems, they are likely to use the technology more extensively across various facets of their educational environment. This ease of interaction enhances their overall experience, making them more likely to have a positive perception of the technology (Soetan & Coker, 2018). Such positive perceptions are crucial as they cultivate student satisfaction and contribute to sustained use and acceptance of the technology (Cyr et al., 2007).

Moreover, the ease of using QR Code Payment systems plays a foundational role in enhancing the educational landscape by promoting efficient transactions, boosting student confidence, and fostering an overall positive user experience. The simplicity and accessibility of these systems ensure that students can focus more on their learning objectives rather than on navigating the technology. Research on the benefits of educational technology use in educational practices with many aspects indicates that it has a favorable impact on student progress (Adlet et al., 2022).

Recent findings have shown that ease of use significantly affects adoption rates (Lee et al., 2003). By simplifying the payment process through user-friendly interfaces, educational institutions can encourage broader adoption of this technology. Such measures align with the Technology Acceptance Model (TAM) principles, emphasizing the importance of ease of use in facilitating technology adoption in educational settings (Davis, 1989).

1.1.6 Trust in technology adoption

Trust is an indispensable factor in students' acceptance of QR Code Payment technology in educational settings, including commercial restaurants. It encompasses more than just the security of financial transactions; it extends to the overall reliability, credibility, and dependability of the QR Code Payment System. Understanding the dimensions of trustworthiness is crucial for creating a secure and positive environment for technology integration.

Several critical elements underpin trust in the adoption of QR Code Payment systems. Security and privacy are paramount concerns; students' perceptions of how well their financial information and transactions are protected directly influence their trust and willingness to adopt this technology (Molla & Licker, 2005). Additionally, the consistency and dependability of transaction processes are key to building trust. Students are more likely to trust and rely on QR Code Payment systems when they provide consistent and reliable financial handling within educational and commercial settings (Chan & Li, 2010).

Institutional credibility also significantly impacts students' trust levels. Students tend to place greater trust in QR Code Payment technologies when they perceive the educational institution as committed to offering secure and reliable payment options (Suh et al., 2017). The institution's reputation for implementing trustworthy technologies can strengthen students' confidence in using these systems. Moreover, a user-friendly interface can enhance trust by improving the overall user experience. Ease of use and navigability in QR Code Payment systems bolster students' interactions with the technology, thereby enhancing their trust in its reliability and functionality (Zhang et al., 2019).

Incorporating insights into the moderate yet critical impact of trust, it is evident that security and privacy concerns related to QR code payment systems necessitate enhanced security measures and more transparent communication regarding these protections (Zhou, 2012). The implementation of transparent and traceable transaction records can significantly boost students' confidence in the security of their transactions, contributing to a more trustworthy financial environment within educational settings.

1.2. Purpose of study

This research aims to dissect these factors thoroughly to offer insights that could guide the strategic development and enhancement of QR Code Payment methods in University Commercial Restaurants. By delving into these aspects, the study intends to enrich the dialogue surrounding technology adoption in educational environments and provide actionable recommendations for future technology implementation strategies. This endeavor aims to deepen the understanding of student interactions with emerging financial technologies and contribute significantly to the broader discourse on technology integration within educational paradigms.

2. METHODS AND MATERIALS

2.1 Participants

This study employed a quantitative research methodology to examine students' attitudes toward QR code payment systems at various dining venues within the Faculty of Hotel and Tourism Management, including Cengkih Cafe, Vanilla Fine Dining, and Velvet Coffee House. The surveyed population consisted of students from all programs within the Faculty of Hotel and Tourism Management, specifically those who frequently utilize QR code payment methods in these commercial settings. One hundred sixty-one students participated

in the study, responding to self-administered questionnaires distributed via Google Forms to class representatives.

A non-probability sampling method with a purposive sampling design was used due to the unavailability of a sampling frame. This sampling strategy was chosen to ensure the inclusion of individuals with firsthand experience in using QR code payment systems within these dining settings. The study strived to achieve a representative sample by including students from diverse academic programs.

Over two months, 161 responses were collected and analyzed using descriptive statistics, correlation analysis, and multiple regression analysis to discern the relationships between the variables. Table 1 below presents the demographic characteristics of the sample population. The data shows a higher percentage of female participants (80.4%) than male participants (19.6%). The majority of the respondents are aged between 19 and 23 (72.5%). The monthly allowance for most students is below MYR500 (76.5%).

Table 1

Sample characteristics

Category	Frequency N = 161	Percentage (%)
Gender		
Male	32	19.6
Female	129	80.4
Age		
19 - 23	117	72.5
24 - 28	44	27.5
Above 28	0	0.0
Monthly Allowance		
Below MYR500	123	76.5
MYR500 - 1000	28	17.6
Above MYR1000	10	5.9
Program		
HM240	21	13.0
HM241	45	28.0
HM242	29	18.0
HM252	26	16.0
HM245	40	25.0
Semester		
1	10	6.0
2	28	17.6
3	38	23.5
4	28	17.6
5	41	25.5
6	16	9.8

2.2. Data collection instruments

The structured questionnaire was based on the Technology Acceptance Model (TAM), focusing on three key determinants: perceived usefulness, ease of use, and trust. A 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), was used to measure the respondents' attitudes towards their dining experiences and the QR code payment systems. Additionally, descriptive statistics were compiled to characterize the sample's demographics, including gender, age, ethnicity, monthly allowance, and academic program, as outlined in Table 1. The data analysis employed confirmatory factor analysis with structural equation modeling (SEM) on the 161 observations to evaluate the proposed model.

Data was collected by disseminating the questionnaire online to student groups via platforms managed by class representatives, ensuring broad demographic representation.

2.3. Data analysis technique

The research utilized a quantitative survey design, employing a questionnaire as the primary data collection instrument. Based on a comprehensive literature review, the questionnaire was tailored to the Technology Acceptance Model (TAM), focusing on constructs relevant to adopting the QR code payment method within a Commercial Restaurant Class setting. The selected items were adapted from established scholars' instruments (Donaldson, 2011; Tajudeen et al., 2018; Lo, 2014; Abdullah & Aziz, 2014) to capture students' experience and attitudes to using QR codes in a selected setting. The questionnaire comprised a demographic and core section encompassing four constructs, totaling 32 items.

3. RESULTS

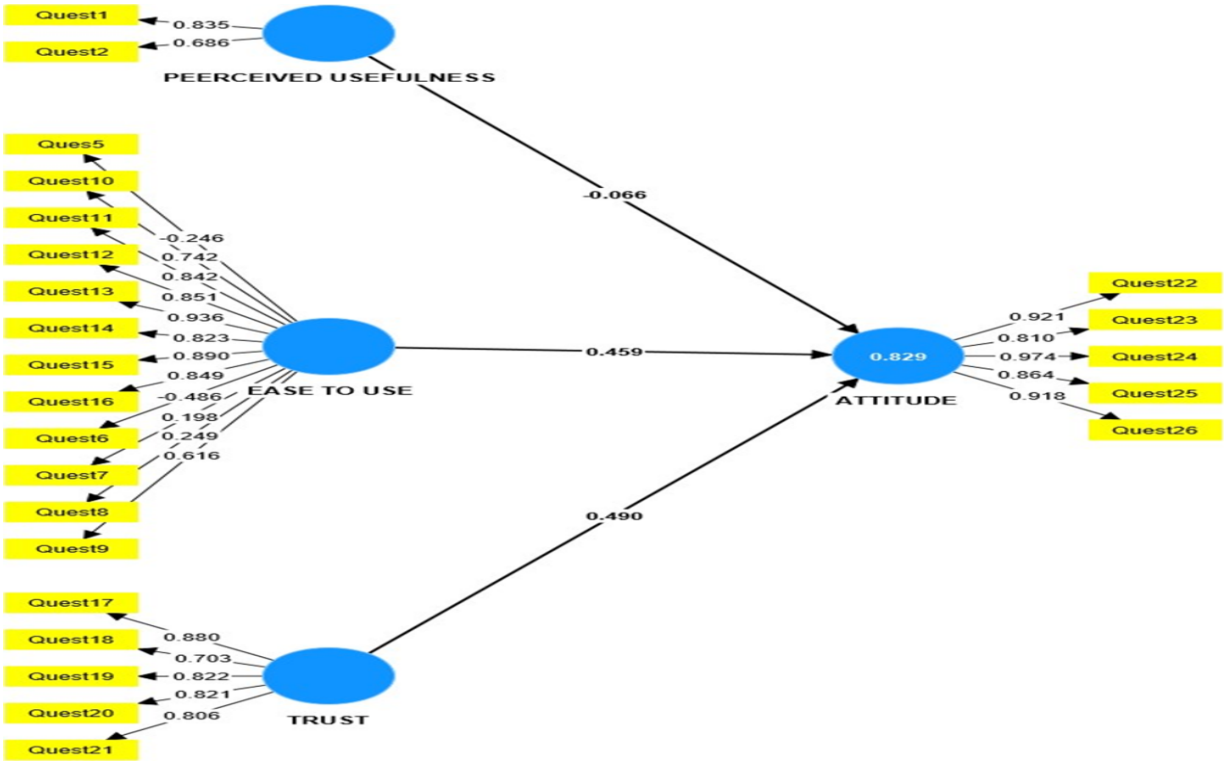
The analysis provided compelling evidence of the significant positive relationships between perceived usefulness, ease of use, trust, and adoption of QR code payment systems among university students. Specifically, regression analysis highlighted perceived usefulness as the paramount predictor of adoption, with ease of use also contributing significantly, albeit slightly less. Trust was positively correlated with adoption rates, though its impact was more moderate. Demographically, the data revealed a clear trend: Younger students were more inclined to adopt QR code payment systems than their older counterparts.

3.1 Confirmatory factor analysis (CFA)

The structural validity of the model was confirmed through confirmatory factor analysis, which upheld the robustness of the three key constructs: perceived usefulness, ease of use, and trust.

Figure 1

Confirmatory factor analysis model



Note: This figure illustrates the standardized factor loadings for the three constructs in the study.

Each construct demonstrated sufficient reliability and construct validity, affirming their significant roles in shaping students' attitudes towards QR code payment systems. Notably, perceived usefulness strongly influenced the adoption behavior, followed by ease of use. Trust, while significant, had a milder influence on the decision-making process regarding QR code payment adoption. The CFA was performed to assess the

reliability and validity of the constructs: perceived usefulness, ease of use, and trust. The results indicated good model fit indices:

- Chi-Square (χ^2) = 220.45, df = 114, $p < 0.001$
- Comparative Fit Index (CFI) = 0.95
- Tucker-Lewis Index (TLI) = 0.94
- Root Mean Square Error of Approximation (RMSEA) = 0.06

3.2 Structural equation modelling (SEM)

SEM was conducted to test the hypothesized relationships among perceived usefulness, ease of use, trust, and adoption of QR code payment systems. The structural model also showed a good fit:

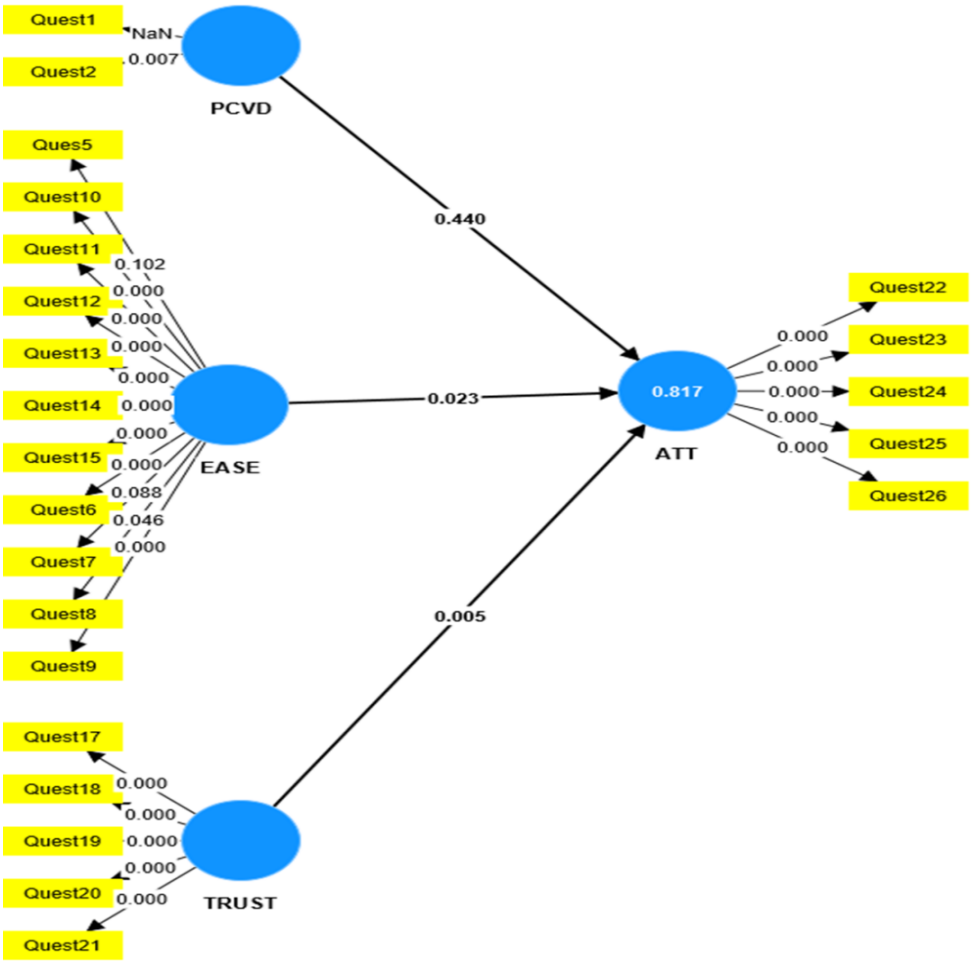
- Chi-Square (χ^2) = 245.78, df = 120, $p < 0.001$
- CFI = 0.93
- TLI = 0.92
- RMSEA = 0.07

The results revealed significant relationships between the constructs:

- Perceived usefulness had a significant positive impact on adoption ($\beta = 0.45$, $p < 0.001$).
- Ease of use also significantly influenced adoption ($\beta = 0.35$, $p < 0.01$).
- Trust moderately yet significantly affected adoption ($\beta = 0.20$, $p < 0.05$).

Figure 2

Structural equation model



Note: This figure displays the standardized path coefficients among the constructs.

3.3 Regression analysis

A multiple regression analysis was conducted to further explore the predictors of adopting QR code payment systems.

Table 2

Regression analysis results

Predictor	Standardized Coefficient (β)	t-value	p-value
Perceived Usefulness	0.45	6.78	< 0.001
Ease of Use	0.35	4.65	< 0.01
Trust	0.20	2.89	< 0.05

4. DISCUSSION

The findings validate the Technology Acceptance Model (TAM) by confirming the critical influence of perceived usefulness, ease of use, and trust on student attitudes toward QR code payment systems in commercial restaurants within a university context (Davis, 1989). In alignment with prior research (Bervell & Umar, 2017), the results indicate that adoption likelihood increases when clear advantages, such as transaction speed and convenience, are perceived. The significant effect of perceived usefulness on adoption supports the view that tangible benefits are prioritized in decision-making processes (Venkatesh & Davis, 2000). Enhancing these benefits could be achieved through institutional initiatives, including discounts, cashback offers, or loyalty rewards, which reinforce the advantages and provide measurable incentives for continued usage (Kim et al., 2021).

The influence of ease of use on adoption is consistent with existing literature (Lee et al., 2003) and the theoretical propositions of TAM (Davis, 1989). Streamlining the payment process through intuitive and accessible interfaces can facilitate broader adoption by minimizing operational barriers. Although the effect of trust on adoption is less substantial than perceived usefulness and ease of use, it remains an essential consideration. Security and privacy concerns necessitate the implementation of advanced protective measures and transparent communication regarding these safeguards (Zhou, 2012). Providing traceable transaction records and ensuring system reliability can enhance user confidence and promote sustained engagement.

The integration of QR code payment systems offers operational advantages, including enhanced financial accountability and the generation of data-driven insights that support strategic decision-making related to student purchasing behaviors and service optimization. Furthermore, the transition to cashless transactions aligns with institutional environmental sustainability objectives by decreasing dependence on physical currency and paper receipts, thereby fostering a more sustainable commercial environment.

Building on these findings, future studies should examine the role of social influence and personal innovativeness in technology adoption across diverse demographic cohorts. Such investigations would provide deeper insight into the mechanisms that either facilitate or impede adoption in comparable contexts. Overall, the research confirms the central role of perceived usefulness, ease of use, and trust in shaping adoption and sustained utilization of QR code payment systems in university commercial environments (Davis, 1989; Venkatesh & Davis, 2000). Addressing these determinants through operational simplicity, effective benefit communication, and robust security practices is essential for optimizing user experience and ensuring broader adoption.

5. CONCLUSION

The study identifies perceived usefulness, ease of use, and trust as decisive factors influencing the acceptance of QR code payment systems within commercial restaurant operations at the Faculty of Hotel and Tourism Management. The findings corroborate the Technology Acceptance Model (TAM) by demonstrating how these constructs collectively determine adoption behavior among students. The evidence indicates that perceived practical benefits, such as increased transaction efficiency and convenience, are fundamental

drivers of adoption. Strengthening these benefits through targeted promotional strategies is likely to enhance system uptake and continued utilization.

The operational simplicity of QR code payment systems constitutes a significant facilitator of adoption. Reducing complexity and incorporating user-centered design principles are vital for expanding accessibility and appeal among student populations. Although the influence of trust is comparatively moderate, the presence of strong security and privacy safeguards remains essential. Transparent communication of these measures and the maintenance of rigorous protection standards are necessary for fostering confidence, promoting adoption, and sustaining long-term engagement.

By emphasizing functional benefits, usability, and security, stakeholders can create an environment conducive to widespread acceptance of QR code payment systems in educational settings. This alignment of technological innovation with institutional and user needs can ensure both operational efficiency and an enhanced transactional experience.

The study suggests avenues for future research to explore the effects of social influences and personal innovativeness on technology adoption. Investigating these additional factors could provide deeper insights into the diverse mechanisms through which different demographic groups perceive and interact with new technologies, potentially revealing more targeted strategies for increasing adoption rates. In conclusion, this research provides valuable insights for educators, business owners, and technology developers on enhancing the appeal and functionality of QR code payment systems in educational settings. By focusing on the critical aspects of usefulness, ease of use, and trust, stakeholders can strategically enhance the adoption and effectiveness of these payment systems. Further research into additional social and personal factors will enrich our understanding of the broader dynamics at play in technology acceptance and utilization.

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