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Maintaining Interaction with Digital Finance: Acceptance of Mobile Payments by Marginalized Women Street Vendors in a Developing Market

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Abstract

This study looks into what influences underprivileged women street vendors in India's continued use of QR code mobile payment systems (QRMPS). Based on the Meta UTAUT model and Expectation Confirmation Theory (ECT), the study looks at how user attitudes and satisfaction are influenced by performance expectancy, effort expectancy, social influence, facilitating conditions, personal innovativeness, perceived trust, and convenience. These factors ultimately lead to sustained usage. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used to examine responses from 566 individuals in this cross-sectional study. The findings show that user happiness is greatly increased by performance and effort expectancy. Convenience, perceived trust, and individual inventiveness are important factors that influence long-term use. The results highlight how QR payment technologies may be used not only as transactional tools but also as tools for financial empowerment and inclusion, making it easier for marginalized women to participate in the digital economy. By concentrating on an underrepresented group and utilizing a strong theoretical integration, this study adds distinctive insights to the expanding corpus of research on digital financial inclusion. Actionable recommendations for policymakers, financial institutions, and technology providers are included in the practical implications. These include: (1) creating icon-based and multilingual interfaces for low-literacy users; (2) implementing localized digital literacy training through NGOs and women-led self-help groups; (3) establishing grievance redressal systems with bilingual support; and (4) guaranteeing official QR code payment functionality for areas with poor connectivity.

Keywords : User satisfaction, Sustained engagement, Meta UTAUT, Mobile payment system, Financial inclusion, Marginalised street vendor

1.0 Introduction

Automation breakthroughs, vast digital networks, and increased internet penetration are driving revolutionary transformations in emerging economies' financial transaction systems.Due to the widespread availability of smartphones and mobile internet, there has been a noticeable transition from traditional cash-based payments to cashless and contact less methods as digitalization takes hold. This allows financial transactions to be managed via mobile devices. Mobile payments in India are expanding at a rate of 33.2%, far faster than in industrialized nations like North America and Europe.With almost 17 billion transactions, the Bharat Interface for Money (BHIM) is a prime example of this trend. All payments made with digital devices, such as online transactions, internet banking, and mobile payments, are referred to as digital payments.

A QR code, which stands for Quick Response code, is a type of barcode that contains information about the associated product. Mobile payments, a subset of digital payments, now depend on this technology. Because QR codes make these transactions safer and more convenient, both customers and merchants find them particularly appealing. Eighty percent of the workforce works in the informal sector, which is greatly impacted by this shift. Digital payments are increasingly acknowledged for their ability to facilitate transactions and increase economic efficiency.A recent study has pointed out that UPI, enabled by QR code technology, has emerged as the leading transaction method throughout rural, semi-urban, and urban India, showcasing widespread acceptance and incorporation of digital payments among diverse demographics. These trends highlight the significance of QR code systems in streamlining transactions, allowing users to execute payments quickly via UPI-enabled apps.

36.60% of India's 1.4 billion urban residents rely heavily on the unorganized sector, which generates 50% of the nation's GDP. In this industry, street vendors are essential to the economic framework and make up 4.2% of urban

employment. According to the Ministry of Urban Development and Poverty Alleviation, these vendors—roughly 10 million in total—produce 63% of the country's GDP and provide 50% of its savings. Surprisingly, one-third of this informal labor sector consists of women street sellers, highlighting their significant economic contribution.For instance, research has shown that using QR codes for mobile payments while travel in China improves convenience and transaction speed, which in turn raises visitor happiness. examined Indonesian customer intentions, highlighting the importance of perceived usefulness and ease of use. examined behavioral and technical factors that affect consumers' willingness to accept payments via QR codes. Similarly, focusing on religious and cultural contexts, it found acceptability variables including security and trust that influenced the intention to use mobile QR code applications, especially among Muslim millennials in Malaysia. However, there is little empirical attention on how users sustain their involvement with these systems over time in these research, which primarily concentrate on the adoption phase. This significant disregard highlights a critical vacuum in empirical study and emphasizes the need to look at extended involvement, as emphasized by.

Furthermore, research on the unique socio-cultural conditions and user preferences in India is conspicuously lacking, especially with regard to marginalized female street vendors. This gap underscores the critical need for focused research to understand how these suppliers continue to use digital payment systems, which is essential for their stability and financial empowerment. Continued research in this area is crucial for several important reasons, including but not limited to:

1. 1. Examining how marginalized women street vendors use mobile payment systems with QR codes adds a great deal to the scholarly conversation around digital financial tools in the informal sector. By concentrating on this specific group, the study hopes to provide fresh perspectives that deepen our comprehension of how these technologies are embraced and used in less formal economic contexts (first theoretical motive).
2. 2. This study also fills in knowledge gaps about the various elements that affect user satisfaction and how they affect the long-term use of mobile payment systems with QR codes. Improving user engagement and retention in digital financial services requires a deeper comprehension of these dynamics (2nd theoretical motivation).
3. Additionally, this study aims to evaluate the applicability and relevance of well-known theories, particularly the ECT, which focuses on user pleasure, and the Meta UTAUT model, which looks at usage attitudes. The research will either confirm or refute the generalizability of these theoretical frameworks by applying these models to the particular setting of marginalized women street vendors (third theoretical motive).
4. Practically speaking, the study will investigate how flow QR code payment technologies can be adjusted to improve vendors' daily experiences, with an emphasis on methods to increase usability and general satisfaction (first practical motivation).
5. Lastly, it's critical to comprehend how consistent use of mobile QR code payments might encourage repeat business. In order to support broader efforts for economic empowerment among these vendors, this part of the study seeks to identify ways that ongoing involvement with these systems can result in increased financial stability (2nd practical motivation).

The Meta UTAUT model and ECT are combined in this study, which enhances these models by incorporating factors like perceived dependability, individual inventiveness, and usability. In order to highlight their combined impact on user involvement, these elements are paired with the crucial role of attitude. Importantly, understanding the factors that encourage marginalized women street vendors to use QR code mobile payment systems and their propensity to stick with them can help service providers, tech developers, and legislators create more appealing and user-friendly mobile payment options for this group. Enhancing the functionality and usability of QR code payment systems can help vendors manage their daily transactions more efficiently, create more reliable and secure financial experiences, and encourage long-term stability and economic empowerment.

This knowledge is crucial for developing interventions that advance the broader goals of financial inclusion and economic strength within underrepresented populations while simultaneously addressing urgent transactional needs.As a result, the following important research question is developed as a result of this study:

RQ1: How are the attitudes and happiness of marginalized women street vendors with regard to QR code mobile payment systems influenced by performance expectancy, effort expectancy, social influence, facilitating conditions, personal inventiveness, perceived trust, and convenience?

RQ2: What impact do user satisfaction and attitude have on marginalized women street merchants' continued use of QR code-based mobile payment systems?

2.0 Literature review

This section provides an overview of prior studies examining the adoption of QR code MPS, alongside the development of the research model and the formulation of hypotheses.

2.1Adoption of QR code mobile payment systems (MPS)

Numerous factors that influence user behavior have been identified by recent studies that have thoroughly examined the application of QR code MPS in various international contexts (Table 1). A solid basis for understanding technology adoption behavior has been provided by theoretical frameworks like the Unified Theory of Acceptance and Use of Technology (UTAUT). However, a number of academics argue that adding more environmental and personal aspects significantly improves our understanding of these behaviors. For instance, stress that a person's motivation and preparedness to accept mobile payments can be greatly impacted by their cultural background, economic activity, and level of digital knowledge. They incorporated components like perceived trust, social norms, and personal inventiveness into their extended models to improve the portrayal of the actions of various user groups. These enhanced models offer a more thorough viewpoint, particularly in informal economies where variables other than technology itself may have an impact on technology acceptance. This broad perspective has helped identify the elements affecting initial acceptance as well as highlighted the significance of user happiness and continued participation in attaining the long-term success and scalability of these technologies. Thus, understanding ongoing use beyond initial adoption is crucial for evaluating the viability of QR code MPS in various socioeconomic and cultural contexts, especially in countries like India where digital financial inclusion is still evolving.

2.2India-Specific digital finance initiatives and regulatory frameworks

Government programs like the Digital India campaign, which aims to enhance digital infrastructure and promote equitable access to digital services, have significantly expanded the digital finance scene in India. The PM Street Vendor's Atma Nirbhar Nidhi (PM SVANidhi) project, which was launched in 2020 to provide working capital loans and encourage the adoption of digital payments, particularly UPI-linked QR code systems, is an important initiative targeted at informal laborers. In addition to these programs, the Reserve Bank of India's Payments Vision 2025 offers a strategy framework with an emphasis on inclusion, accessibility, and confidence in order to increase the adoption of digital payments.By standardizing QR codes and streamlining merchant onboarding, the National Payments Corporation of India (NPCI) has improved this ecosystem and encouraged broad platform compatibility. From a regulatory perspective, these frameworks have enhanced security, transparency, and complaint resolution procedures—all of which are critical for fostering customer pleasure and trust. Despite these efforts, marginalized women vendors still face a number of challenges, including poor internet connectivity, language barriers, and a lack of digital literacy. These restrictions emphasize how crucial it is to frame adoption behavior by taking individual-level characteristics and national policy into account.

Table 1 Past studies on adoption of quick response mobile payment system (QRMPS). Source: authors' work based on literature.

Research Focus and Context	Country	Theory	Sample	Analysis	Independent Variable	Dependent Variable	R^2 of A, BI, and AU
The path to cashless transaction: A study of user intention and attitudes to- wards	Bangladesh	UTAUT	412	PLS-SEM, FGD	PE, EE, SN, FC, PS, PSE, PT, H, SC	A, BI, AU	0.540,0.593 and 0.410

quick response mobile payments							
Under- standing consumer adoption of mobile payment in India: Extending Meta-UTAUT model with personal innovativeness, anxiety, trust, and grievance redressal	UK	Meta UTA UT	491	PLS-SEM	PE, EE, SN, FC, An, PI, T and GR	BI, AU	0.660 and 0.500
Factors affecting Gen Z's intention to use QR Pay after Covid-19.	Vietnam	TAM and UTA UT	415	PLS-SEM	PU, PEOU, PS, PC, PI, SI, Covid-19	BI	Not shared
Acceptance Factors Affecting the Intention to Use Mobile Payments: QR Code Applications	Malaysia	UTAU T2	215	SPSS	PE, EE, HM, H, T	BI	0.77
Analysis of the Application of the Unified Theory of Acceptance and Use of Technology 3 (UTAUT-3) Model on Intention and Use Behavior of Users of Mobile Banking Applications	Kosovo	UTA UT-3	200	PLS-SEM	PE, H, PI, FC, HM, PV, SI	BI, AU	0.713 and 0.618
The moderating influence of brand image on consumers' adoption of QR-code e-wallets	Malaysia	UTA UT	305	PLS-SEM	PE, EE, SI, FC, HM, PV, BRI	BI	0.237
The dif- fusion of mobile QR-code payment: an empirical evaluation for a pandemic	Vietnam	PM T, UT AU T	411	SPSS and CB-Sem	PSE, PSUS, SE, PE, EE, SI, PDF	BI	0.367
Smile to pay: Predicting continuous usage intention toward contactless payment services in the post-COVID-19 era	China	SOR mod el with DOI, UTA UT & AID UA	321	PLS-SEM	RA, CO, UTA, PS, PE, EE	Contin u- ous Usage intenti on	Not shared
Under- standing user	Turkey	Exte	485	PLS-SEM	PU, SN, PC,	BI	0.65

acceptance of QR code mobile payment systems in Turkey: An extended TAM		nd-ed TAM			PS, PEOU, PT		
Adoption intention of mobile QR code payment system among marginalized street vendors: an empirical investigation from an emerging economy	India	UTAUT	320	PLS-SEM	Digital Financial Literacy, Personal Innova-tiveness, Perceived Trust, PE, EE, SN, FC	BI	Not shared
Adoption of digital payment systems in the era of demonetization in India: An empirical study	India	UTAUT2-IRT	766	PLS-SEM	UTAUT2 variables	AU	Not shared
The current study	India	Meta-UTAUT with ECT	566	PLS-SEM	PE, EE, SI, FC, PI, PT, C	A, QRUS, SE	0.77

PE-Performance Expectancy, EE-Effort Expectancy, SN-Social Norms, SI-Social Influence, FC- Facilitating Conditions, PT- Perceived Trust, T- Trust, H- Habit, PSE-Perceived Self Efficacy, SC- Self -Concept, GR- Grevience Redressal, RA-Relative Advantage, Com-Compatibility, USI-User-Interface Attractiveness, PS-Perceived Security, C-Convenience, PI-Personal Innovativeness, PEOU-Perceived Ease of Use, BI-Behavioral Intention, A-Attitude, AU- Actual Usage, UTAUT- Unified Theory of Acceptance and Use of Technology, TAM-Technology Acceptance Model, SOR-Stimuli Organism Response, PLS-SEM- Partial Least Squares Structural Equation Modelling, FGD-Focus Group Discussion

2.4 Hypothesis development

2.4.1 Performance expectation

According to performance expectancy (PE), an individual's trust in a technology's effectiveness has a significant impact on their overall effectiveness and job performance. This belief shapes the user's perspective, reflecting their general feelings and preferences when it comes to using technology like QR mobile payment systems. Users' impression of the technology improves as they realize that these systems increase transaction efficiency, reduce errors, and speed up sales processes. This is driven by the real benefits to their business operations. The relationship between performance expectations and attitude has been repeatedly supported by numerous research conducted in various countries, particularly with regard to mobile payments.When QR mobile payment solutions are thought to significantly improve the commercial efficiency of marginalized women street vendors, a positive outlook emerges. Promoting user happiness, which assesses whether the technology meets or beyond the user's expectations, requires this optimistic outlook. The relationship between performance expectations and the actual advantages of the technology improves the user's positive outlook and raises satisfaction, which leads to continued use and engagement with the technology. Thus, the hypotheses proposed were:

Hypothesis H1a Performance expectancy positively influences the attitude of women street vendors towards QR mobile payment systems.

Hypothesis H1b Performance expectancy positively influences user satisfaction among women street vendors using QR mobile payment systems.

2.4.2 Effort expectancy

Women street vendors' views and satisfaction levels with QR mobile payment systems are greatly influenced by effort expectancy, which is defined as the perceived ease of using technology. By making it simpler to integrate new technology into routine processes, this idea affects user attitudes by increasing initial acceptance and ongoing system satisfaction. Numerous empirical research have shown that the perceived ease of use directly promotes technology adoption. The ease of learning and using a QR mobile payment system improves the mindset of female street vendors by reducing the mental strain and potential anxiety associated with adopting new technology. This positive perspective is crucial because it promotes a willingness to integrate technology into their company processes.Simultaneously, customer satisfaction rises when QR systems are straightforward and simple to use. The system's simple design ensures that users' needs for quick and precise transactions are met, increasing business efficacy and reducing operational strain. In addition to encouraging initial acceptance, this user-friendliness encourages continued participation, which is crucial for long-term user satisfaction and underrepresented vendors' empowerment. As a result, effort expectancy influences attitudes and significantly raises user happiness, underscoring its crucial role in the successful adoption and continued use of QR mobile payment systems. Consequently, theories were developed as.

Hypothesis H2b Effort expectancy positively influences the attitude of women street vendors towards QR mobile payment systems.

Hypothesis H2b Effort expectancy positively influences user satisfaction among women street vendors using QR mobile payment systems.

2.4.3 Social influence

Social impact measures how much people think important people in their surroundings, such as peers or local leaders, anticipate them to use the technology. Vendors are encouraged to see the technology favorably by the presence of positive social proof, which occurs when they witness their peers successfully using and benefiting from QR systems. In addition to lowering concerns about adopting new technologies, this kind of observational learning creates a supportive environment for change. According to research, peer pressure and community norms have a big impact on how people see technology adoption, making it more desirable and acceptable for suppliers.

Furthermore, as said, merchants' satisfaction increases when they recognize that using QR systems satisfies peer and consumer expectations. This satisfaction results from successfully meeting consumer requests for digital payment methods, which enhances service delivery and improves the vendor's reputation. Their general satisfaction with the technology is much increased when they can readily satisfy these societal expectations. Thus, among female street vendors who utilize QR mobile payment systems, social impact not only improves attitudes but also significantly increases consumer happiness.

Hypothesis H1c: Social influence positively influences the attitude of women street vendors towards QR mobile payment systems.

Hypothesis H2c: Social influence positively influences user satisfaction among women street vendors using QR mobile payment systems.

2.4.4 Facilitating conditions

The degree to which consumers are aware of the resources and technological infrastructure that can enable the adoption of the technology is known as the facilitating conditions. Users' capacity to use digital financial services will be improved by the availability of internet connectivity, a positive work environment, technological know-how, and simple system access. Positive settings have a major impact on people's intents to utilize various digital financial services, according to numerous prior research.Enabling conditions could include the availability of smartphones, access to reasonably priced internet, technical support, and the presence of a network or community that supports marginalized

women street vendors' continued desire to use mobile QR code payment systems. A positive adoption experience, increased technological satisfaction, and a strong desire to continue using it are all facilitated when the necessary infrastructure and support are perceived to be in place. This highlights the importance of both the technology and its surroundings in fostering successful technology adoption and continued use. The theory, supported by the literature, has been determined to be:

H1d: Facilitating conditions positively influence the attitude of marginalized women street vendors towards adopting a mobile QR code payment system.

H2d: Facilitating conditions positively influence the satisfaction of marginalized women street vendors with a mobile QR code payment system.

2.4.5 Personal innovativeness

The term "personal innovativeness" (PI) describes people's propensity to embrace new information technologies and their readiness to look for and use novel solutions. High PI can significantly benefit street sellers, who frequently deal with little resources and need to be creative in their operations. This can increase their readiness to adopt QR payment systems, which are known for their efficiency and usability. Because they are more likely to explore and make full use of the capabilities offered, this trait not only encourages individuals to try out new technologies but also increases their satisfaction with these tools.The term "personal innovativeness" (PI) describes people's propensity to embrace new information technologies and their readiness to look for and apply creative solutions. Street sellers, who frequently operate with few resources and must be creative in their operations, might benefit immensely from a high PI. This could increase their inclination to adopt QR payment systems, which are known for their efficiency and user-friendliness. This trait encourages people to experiment with new technologies and increases their pleasure with these tools because of their propensity to investigate and fully exploit the available capabilities.

H1e: Personal innovativeness has a favorable and substantial impact on marginalized

women’s street vendors’ attitudes.

H2e: Personal innovativeness has a favorable and substantial impact on marginalized women street vendors’ satisfaction with QR code mobile payment system.

2.4.6 Perceived trust

Trust influences both the acceptance and continued use of these technologies. It is typified by the conviction that the technology is reliable and the provider's dedication to the welfare of the user. By reducing worries about security and reliability, a strong sense of confidence encourages companies to accept QR payments more easily. The suppliers' confidence in regularly integrating these solutions into their operations is increased by this reduction in perceived risk. Furthermore, trust influences long-term user happiness by ensuring that transactions are secure and private, supporting the vendors' decision to continue using QR payment systems. This ongoing guarantee of transaction security and confidentiality enhances contentment, which is vital for maintaining their usage and fostering financial empowerment. Consequently, the assumptions presented in this research are:

Hypothesis H1f Perceived trust positively influences the attitude of women street vendors towards QR mobile payment systems;

Hypothesis H2f Perceived trust positively influences user satisfaction among women street vendors using QR mobile payment systems.

2.4.7Convenience

By simplifying and speeding up transactions, QR mobile payment solutions significantly increase user engagement. This is crucial for street sellers who place a high value on simplicity and efficiency in their business practices. Convenience's immediate benefits, such as quicker transaction times and the capacity to manage finances while on the road, encourage a positive viewpoint among sellers. This positive perspective makes them more willing to use the technology and recommend it to their networks, making it the go-to choice for regular commercial transactions. Additionally, when the system consistently offers quick, simple, and safe transaction methods, customer satisfaction significantly rises. Increased convenience for street sellers means less time spent managing money and more time for

other business-related activities, which directly contributes to their comfort and business success. This operational efficiency addresses their current requirements while also fostering long-term contentment, promoting ongoing utilization of the technology. Thus, the research proposes the subsequent hypotheses:

Hypothesis H1g Convenience positively influences the attitude of women street vendors towards QR mobile payment systems.

Hypothesis H2g Convenience positively influences user satisfaction among women street vendors using QR mobile payment systems.

2.4.8Influence of attitude on sustained engagement using QR code mobile payment system

Women street sellers' continued usage of QR code mobile payment systems is greatly impacted by their opinions of the technology, which are shaped by their perceptions of its practicality, ease of use, and general benefits for their day-to-day operations. When suppliers recognize the system's importance in increasing business efficiency, reducing transaction times, and simplifying financial control, a positive attitude emerges. This optimistic perspective is critical for the technology's early adoption as well as for promoting continued use. When street vendors have a positive perception of QR payment systems, they are more likely to integrate them into their regular business operations and stick with them over time, even when new technologies emerge. Consequently, a firmly rooted positive mindset serves as a reliable indicator of ongoing involvement, guaranteeing that vendors uphold their dedication to the technology and persist in enjoying its advantages for their enterprises.

Hypothesis H3 A positive attitude towards QR code mobile payment systems signifi- cantly influences sustained engagement among women street vendors.

2.4.9 Influence of user satisfaction on sustained engagement

A person's sense of happiness or discontent in relation to their anticipated outcomes is frequently used to describe user satisfaction. The degree to which consumers feel the technology meets or exceeds their expectations for performance, dependability, and convenience is indicated by user satisfaction with QR code mobile payment systems. Because it affects consumers' loyalty and propensity to continue using the technology, contentment is a crucial component of sustained engagement. Street sellers are more likely to stick with the QR payment system if they are satisfied with its reliability, efficiency, and security. This continued satisfaction not only fosters repeated use but also promotes the system among colleagues, aiding its wider acceptance and incorporation into everyday business operations

Hypothesis H4 User satisfaction with QR code mobile payment systems significantly influences sustained engagement among marginalised women street vendors.

3.0 Research methodology

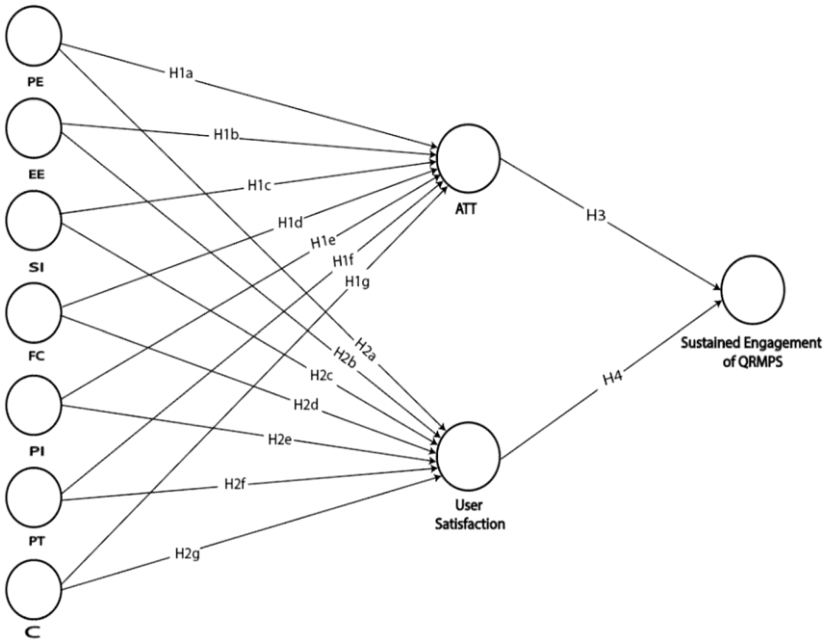
The study looks at the degree of user satisfaction and sustained use of QR code mobile payment systems among marginalized women street vendors. We conducted the poll offline using a standardized paper questionnaire to ensure accessibility and ease for the participants, many of whom have low internet abilities and time constraints. In order to reduce prejudice resulting from literacy, trained female enumerators administered the questionnaire in person in the respondents' preferred local language, reading each question aloud and recording responses. In real-world sales environments, this approach allowed for quick interaction and accurate data collecting.Fig. 1 illustrates the conceptual model

3.1 Instrumentation

A brief explanation of the QR code mobile payment mechanism is included in the two sections of the poll. Demographic information including gender, age, income, education, kind of vending, and duration of use are included in the first section. The Meta-UTAUT model's constructs—performance expectancy, effort expectancy, attitude, social influence, facilitating conditions, user satisfaction, and the likelihood of continuous system use (sustained engagement)—as well as domain-specific constructs like convenience, perceived trust, and personal inventiveness are highlighted in the following section. Similarly, the elements for continuous engagement and user pleasure were changed. The researchers utilized a five-point Likert scale, from “5-strongly agree” to “1-strongly disagree,” to evaluate all questions associated with the variables. The

survey was initially assessed for content validity by three academic professionals, then a pilot study was conducted with 30 knowledgeable users of QR code mobile payment systems to verify face validity. This procedure, in accordance with the guidelines proposed by, improved the questionnaire utilizing feedback aimed at boosting clarity and design. Modifications were implemented prior to its distribution to the wider study group

Figure 1 Proposed Conceptual Framework using Extended Meta-UTAUT and Expectancy Confirmation Model.



3.2 Sampling design and data collection

A multi-stage strategy was employed to balance regional variety with pragmatic field issues because there was no comprehensive list of marginalized women street vendors.

Phase 1: Likelihood layer classification by region. To represent the variation in the acceptance of digital payments, India was divided into four macro regions: South, West, North, and East.

Phase 2: Urban selection (layer of intent). Two cities (Bangalore, Chennai, Hyderabad; Bhubaneswar, Mumbai; Delhi, Pune; Kolkata) were chosen for each region based on (i) the greatest UPI transaction volumes and (ii) existing clusters of women sellers, taking into account the study team's logistical viability.

Phase 3: Non-probability category vendor registration. Purposive sampling was used in each city by trained female enumerators to reach eligible vendors (≥ 18 years, currently accepting QR payments) selling a range of goods, including clothing, seafood, flowers, fruits, vegetables, and food stalls in these lively areas; snowball referrals were used to find vendors in unofficial lanes. This approach aligns with previous studies on female street vendors and is recommended for hard-to-reach populations. We asked marginalized street vendors a straightforward "Yes" or "No" inquiry to confirm their prior usage of QR code mobile payment systems in order to further narrow down our sample. The next sections of our survey were only accessible to suppliers who attested to prior use.

We used a GPower analysis and Harman's single-factor test to confirm the correctness of the responses and the adequacy of our sample size. According to the Harman's test, the largest variance explained by a single factor was 40.299%, which is less than the suggested 50% standard. This suggests that considerable common technique bias had little effect on our responses. To assess the sufficiency of our sample size, we applied the GPower software, configuring the effect size f^2 to 0.15, the significance level α to 0.05, and the power to 95%, in accordance with the recommendations by. Although the analysis indicated that a sample size of 166 was required, our actual sample size was 566 (Fig. 2), indicating that our sample size was sufficient for a comprehensive statistical analysis..

4.0 Data analysis

The suggested conceptual framework is assessed using the variance-focused PLS-SEM approach because to its improved flexibility and efficiency in managing intricate models with many latent variables and few observable variables. This approach works especially well when data distributions are abnormal.

4.1 Respondents demographic profiling

In our study, 65.2% of the sample of marginalized women street sellers between the ages of 26 and 45 showed high adoption rates of QR code mobile payment systems, indicating high usage among middle-aged vendors. In terms of education, over half of the participants (50.5%) had at least a secondary education, while 17.7% had no formal education. This shows that people with different levels of education can use QR payment systems. Economically speaking, 48.6% of sellers earn between INR 20k and 40k per month, and 19.4% of those with incomes under INR 20k actively use the technology. The sellers participating in this research offer a range of items such as vegetables, fruits, flowers, and food, showcasing the adaptability of QR payment systems in supporting diverse commercial endeavors. Notably, 66.2% have utilized these systems for 1 to 3 years, while 8.5% have been using them for more than three years, reflecting both an increasing adoption and a consistent use of the technology (Table 2)

4.2 Reliability and validity test

The measuring model was examined by evaluating the validity and reliability of the scales, as indicated in Table 3. Standardized factor loadings were used to evaluate each item's reliability. The reliability of each item listed in Fig. 3 is shown by the factor loadings, which were found to be greater than 0.7. Before determining the structural model, average variance extracted (AVE), composite reliability (CR), and Cronbach's alpha (CA) metrics were used to assess convergent validity and internal consistency reliability. The findings show that convergent validity was successfully achieved because every average variance extracted (AVE) value, which ranged from 0.787 to 0.896, above the predetermined threshold of 0.50. Moreover, Cronbach Alpha (CA) values varied from 0.729 to 0.948, surpassing the suggested threshold of 0.70, indicating a satisfactory degree of reliability.

Table 2 Demographic profile of the respondents ($n = 566$)

Demographic Details	Characteristics	Frequency	Percentage
Age (in years)	18 to 25 Years	60	10.6
	26 to 35	168	29.7
	36 to 45	201	35.5
	46 to 60	104	18.4
	More than 60 Years	33	5.8
Education	No formal studies	100	17.7
	Upto class 5th	107	18.9
	Matriculate	111	19.6
	10+2 pass	182	32.2
	Graduate and above	66	11.7
Monthly income (in INR)	< 20,000	110	19.4
	20001 to 30000	136	24.0
	30001 to 40000	139	24.6
	40001 to 50000	92	16.3

	More than 50000	89	15.7
Nature of selling	Gocery shop	90	15.9
	Street vendor	85	15.0
	Road side seller	86	15.2
	Garment shop	83	14.7
	Hawker	73	12.9
	Resturants	149	26.3
Duration (in years) used for Digital payment system?	< 1	187	33.0
	1–2	188	33.2
	2–3	143	25.3
	> 3	48	8.5
Source(s): Field data			

Table 3 Construct reliability and validity results

Construct	**Cronbach's Alpha**	**Composite Reliability (CR)**	**Average Variance Extract- ed (AVE)**
Sustained Engagement (SE)	0.903	0.939	0.837
QR User Satisfaction (QRUS)	0.917	0.948	0.858
Attitude (ATT)	0.942	0.963	0.896
Convenience (C)	0.729	0.881	0.787
Effort Expectancy (EE)	0.948	0.963	0.865
Facilitating Conditions (FC)	0.909	0.943	0.846
Personal Innovativeness (PI)	0.899	0.937	0.832
Perceived Trust (PT)	0.940	0.957	0.847
Performance Expectancy (PE)	0.919	0.949	0.861
Social Influence (SI)	0.935	0.958	0.884
Source(s): Authors' own work using PLS-SEM			

Composite reliability values of sustained engagement (0.939), user satisfaction (0.948), attitude (0.963), convenience (0.881), effort expectancy (0.963), facilitating condition (0.943), social influence (0.958), personal innovativeness (0.937), perceived trust (0.957), and performance expectancy (0.949) all exceeded the threshold of 0.70, confirming the internal consistency of the constructs.

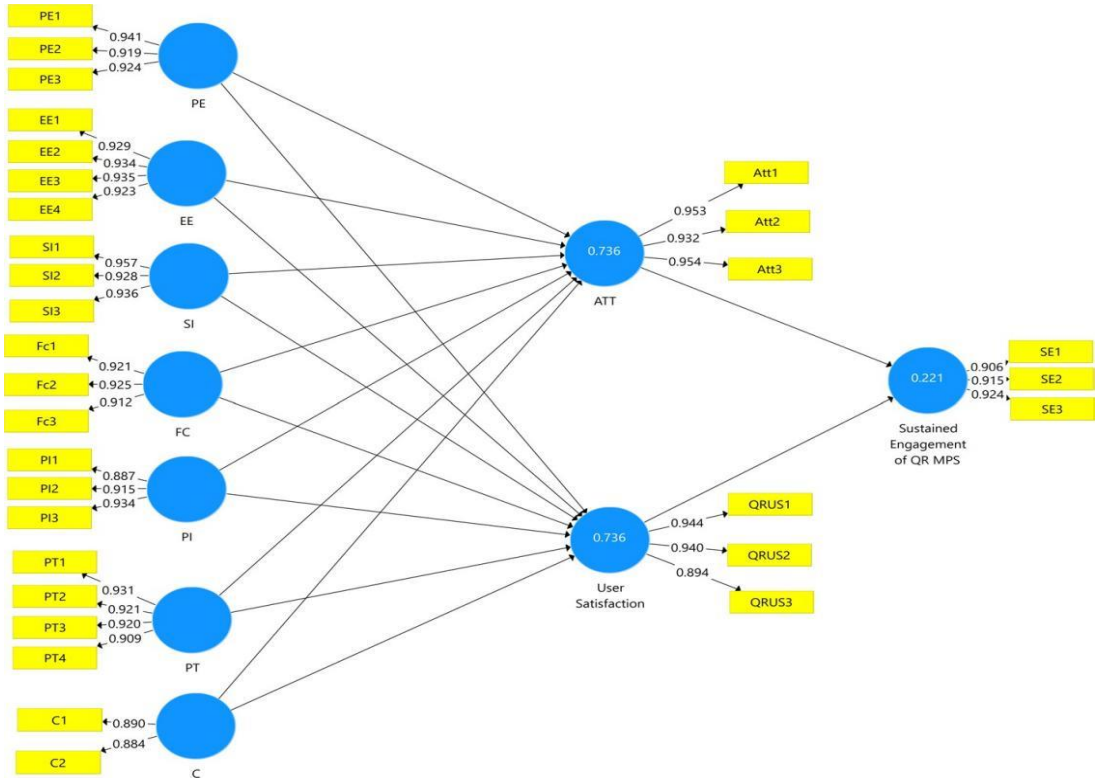


Fig. 3 Measurement Model. Source(s): Authors' work using PLS-SEM

Multicollinearity occurs when two or more variables within a model are highly correlated, making it difficult to determine the separate impact of each variable. We utilized the Variance Inflation Factor (VIF) to examine this issue. VIF values ought to remain under 5 to ensure that multicollinearity is not a concern [75]. In our research, all VIF values were significantly below this threshold, varying from 1.489 to 4.500 (Table 4), indicating that the variables in our model are not overly correlated and the findings can be relied upon. The Fornell-Larcker criterion and the Heterotrait Monotrait (HTMT) ratio test were utilized to evaluate the discriminant validity of the constructsWhen the square root of each construct's Average Variance Extracted (AVE) is higher than the corresponding inter-construct correlations [76] (Table 5), discriminant validity is demonstrated according to the Fornell-Larcker criterion. Across all constructs, the results met this requirement, demonstrating sufficient discriminant validity. The distinctiveness and measurement accuracy of the constructs were further supported by the fact that all construct pairs' HTMT values were found to be below the conservative criterion of 0.90 [75]. When combined, these two methods offer strong proof that the model's latent constructs are conceptually unique and empirically distinguishable, as Table 6 illustrates.

4.3 Model fit evaluation

The overall model fit was assessed using several key indices, including Standardised Root Mean Square Residual (SRMR]), d_ULS, d_G, Chi-square, and Normed Fit Index (NFI) as shown in Table 7. The SRMR values were 0.036 for the saturated model and 0.069 for the estimated model. Both values fall well below the acceptable threshold of 0.08, indicating that the model fits the data well. The discrepancy measures, d_ULS and d_G, reflect the degree of difference between the observed and predicted correlation matrices. The d_ULS values of 0.632 (saturated) and 2.379 (estimated), and d_G values of 0.754 and 0.885, respectively, suggest that the structural model maintains a reasonable level of accuracy in reproducing the observed data.

Table 4 Variance inflation factor (VIF) with item statements

Construct	Item Code	Item Statement	VIF
Sustained	SE1	I plan to continue using QR code mobile payment systems in the future.	2.858

Engagement (SE)	SE2	I would recommend using the QR code payment system to other street vendors and small business owners.	2.752
	SE3	My use of QR code mobile payment systems has increased over time.	3.007
QR User Satisfaction (QRUS)	QRUS1	I am satisfied with my decision to use QR code mobile payment systems.	4.01
	QRUS2	The QR code payment system has improved my interactions with customers, making transactions smoother and more efficient.	3.933
	QRUS3	I am not satisfied with my experience of using QR code mobile payment systems.	2.642
Attitude (ATT)	Att1	Using QR-code mobile payment systems is a wise idea.	4.161
	Att2	Using QR-code mobile payment systems is beneficial.	3.634
	Att3	Using QR-code mobile payment systems is pleasant.	3.201
Convenience (C)	C1	QR code mobile payment is convenient because the phone is usually with me.	1.489
	C2	QR code mobile payment is convenient because I can use it anytime and in any situation.	1.489
Effort Expectancy (EE)	EE1	My interaction with the QR mobile payment system is clear and understandable.	4.492
	EE2	It would be easy for me to become skilful at using QR mobile payment system.	3.194
	EE3	I believe that it is easy to understand the interface and functioning of QR mobile payment system.	3.885
	EE4	It is easy to perform the steps required to use QR mobile payment system.	3.638
Facilitating Conditions (FC)	Fc1	I have the resources (equipment) necessary to use the QR mobile payment system.	4.492
	Fc2	I know to use the QR mobile payment system.	3.194
	Fc3	I believe that QR mobile payment system is compatible.	3.885
Personal Innovativeness (PI)	PI1	If I hear about innovative technology, I will try it.	2.301
	PI2	I am usually one of the first among my peers to explore new information technology.	3.161
	PI3	I would like to try out new information technology and prefer to use.	3.504
Perceived Trust (PT)	PT1	Transactions happening through QR mobile payment system are trustworthy.	4.5
	PT2	I am confident that the service provider will keep my financial transaction information from the QR mobile payment system private.	4.113
	PT3	I believe that my business transactions through QR mobile payment system will always be transparent.	4.16
	PT4	I believe QR mobile payment system providers act honestly and protect interest.	3.753
Performance Expectancy (PE)	PE1	Using QR mobile payment system would be advantageous.	3.69
	PE2	Using QR mobile payment system enhances my productivity.	3.092
	PE3	Using QR mobile payment system is very useful in my daily business.	3.339
Social Influ-	SI1	People who are in the near business place think I should use QR mobile	4.167

ence (SI)		payment system.	
	SI2	People whose opinions I value prefer me to use QR mobile payment system.	3.461
	SI3	People who are important to me view and support my use of QR mobile payment system as beneficial.	4.119

Given that Chi-square is sensitive to large sample numbers, the Chi-square values, while slightly different between the models (2577.477 for the saturated and 2871.578 for the estimated), are consistent with expectations. It should therefore be interpreted in conjunction with other fit indicators.Lastly, the saturated and approximated models had NFI values of 0.864 and 0.848, respectively. These numbers show a respectable degree of fit even if they are marginally below the optimal cutoff of 0.90. When combined, the model fit statistics demonstrate that the estimated model is suitable for more investigation.

Table 5 Fornell larcker criterion for discriminant validity

Construct	**ATT**	**C**	**EE**	**FC**	**PE**	**PI**	**PT**	**SI**	**SE**	**QRUS**
ATT	0.947									
C	0.259	0.887								
EE	0.623	0.064	0.930							
FC	0.683	0.076	0.669	0.920						
PE	0.448	0.055	0.450	0.395	0.928					
PI	0.774	0.168	0.607	0.699	0.391	0.912				
PT	0.764	0.211	0.582	0.721	0.452	0.731	0.920			
SI	0.761	0.174	0.537	0.624	0.413	0.710	0.840	0.940		
SE	0.453	0.130	0.396	0.405	0.708	0.370	0.494	0.447	0.915	
QRUS	0.732	0.192	0.616	0.724	0.417	0.788	0.770	0.744	0.419	0.926
Source(s): Authors' own work using PLS-SEM										

Table 6 HTMT ratio for discriminant validity

	ATT	**C**	**EE**	**FC**	**PE**	**PI**	**PT**	**SI**	**SE**	**QRUS**
ATT										
C	0.313									
EE	0.658	0.079								
FC	0.738	0.093	0.720							
PE	0.480	0.066	0.481	0.431						
PI	0.840	0.208	0.656	0.773	0.430					
PT	0.811	0.255	0.615	0.780	0.485	0.794				
SI	0.811	0.211	0.569	0.676	0.444	0.774	0.894			
SE	0.489	0.159	0.427	0.445	0.775	0.408	0.533	0.486		

QRUS	0.783	0.235	0.656	0.790	0.452	0.864	0.825	0.797	0.455	
Source(s): Authors' own work using PLS-SEM										

Table 7 Model fit evaluation

Model Fit Indices	Saturated Model	Estimated Model
SRMR	0.036	0.069
d_ULS	0.632	2.379
d_G	0.754	0.885
Chi-Square	2577.477	2871.578
NFI	0.864	0.848

1.1 Hypothesis testing

The suggested model and the hypotheses were tested using PLS-SEM [78] as illustrated in Fig. 4 and detailed in Table 8. The perception of women street vendors regarding the performance expectancy (H1a: β = 0.064, t = 2.545**), effort expectancy (H1b:β = 0.118, t = 3.191***), Social influence (H1c:β = 0.273, t = 5.773***), Facilitating conditions (H1d:β = 0.103, t = 2.341**), personal innovativeness (H1e:β = 0.310, t = 5.999***), perceived trust (H1f:β = 0.112, t = 2.059) and convenience (H1g:β = 0.117, t = 4.604***) of experiencing QR mobile payment systems significantly influence their attitude towards these systems. Similarly, women street vendors' perception regarding effort expectancy (H2b:β = 0.073, t = 1.999), Social influence (H2c:β = 0.191, 4.078), Facilitating conditions (H2d: β = 0.187, t = 3.356***), personal innovativeness (H2e:β = 0.342, t = 6.456***), perceived trust (H2f: β = 0.163, t = 2.579**) and convenience (H2g: β = 0.046, t = 1.879*)of experiencing QR mobile payment systems have a significant influence on their satisfaction towards these systems but not H2a. Last but not least, the findings underscore that a positive attitude (H3: β = 0.315, t = 5.249***) towards QR mobile payment systems and high user satisfaction (H4: β = 0.188, t = 3.245***) are crucial in driving sustained engagement among women street vendors with these systems.

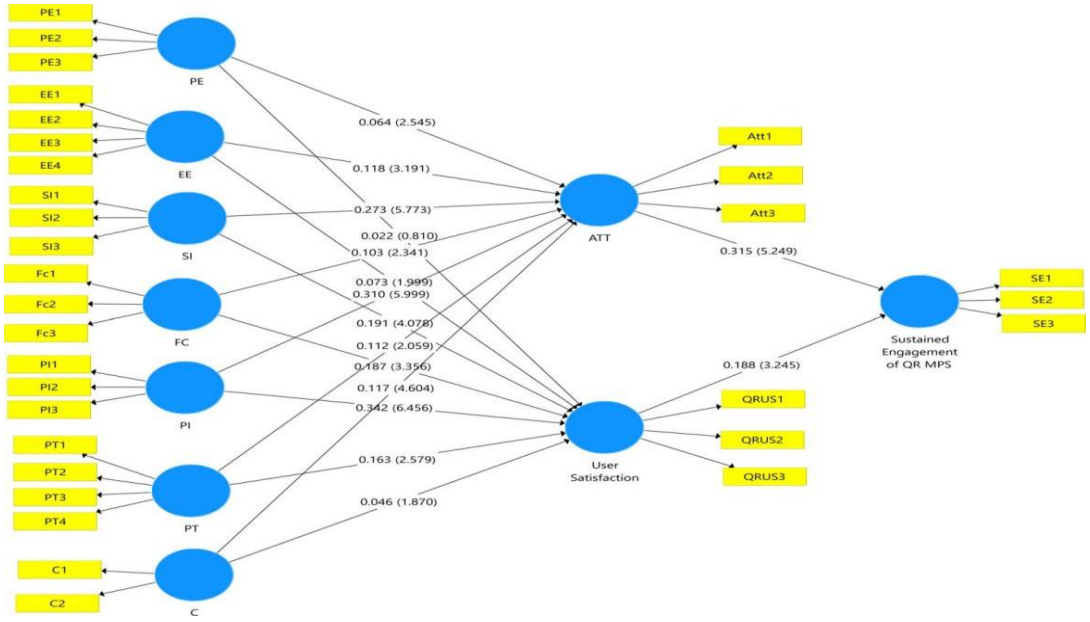


Fig. 4 Structural Model. Source(s): Authors' work using PLS-SEM

Table 8 Assessment of structural model for hypothesis testing

Hypothesis: Path	Path Coefficient	T-Stats	Supported
H1a: PE ->ATT	0.064	2.545**	Yes
H2a: PE->QRUS	0.022	0.810	No
H1b: EE ->ATT	0.118	3.191***	Yes
H2b: EE->QRUS	0.073	1.999**	Yes
H1c: SI ->ATT	0.273	5.773***	Yes
H2c: SI->QRUS	0.191	4.078***	Yes
H1d: FC ->ATT	0.103	2.341**	Yes
H2d: FC->QRUS	0.187	3.356***	Yes
H1e: PI ->ATT	0.310	5.999***	Yes
H2e: PI ->QRUS	0.342	6.456***	Yes
H1f: PT ->ATT	0.112	2.059**	Yes
H2f: PT->QRUS	0.163	2.579**	Yes
H1g: C->ATT	0.117	4.604***	Yes
H2g: C->QRUS	0.046	1.879*	Yes
H3:ATT->SE	0.315	5.249***	Yes
H4: QRUS ->SE	0.188	3.245***	Yes

Source(s): Authors' own work using PLS-SEM.

* represents p < 0.1** represents p < 0.05; *** represents p < 0.01.

Table 9 Predictive relevance (Q^2) of endogenous constructs

Construct	SSO	SSE	Q^2 (=1 – SSE / SSO)
Attitude	1698	590.549	**0.652**
User Satisfaction	1698	641.199	**0.622**
Sustained Engagement of QR MPS	1698	1391.890	**0.180**

4.6 Importance performance analysis

The Importance-Performance Map Analysis (IPMA) was performed to evaluate the crucial factors influencing sustained engagement with QR MPS among marginalized female street vendors. As demonstrated in Fig. 5; Table 10. User Satisfaction (dark blue square) is the key factor, showing the highest total effect (0.27) and strong performance (72), suggesting that improving user satisfaction is expected to yield the most significant impact on ongoing usage. Attitude (blue square) and Personal Innovativeness (yellow triangle) demonstrate significant importance with moderate-to-high performance, indicating that promoting a positive perspective on QR payments and nurturing receptiveness to new technologies can effectively enhance ongoing engagement. Conversely, Effort Expectancy (green triangle) and Convenience (red circle) show strong performance (over 75) yet limited importance (total effects under 0.08), suggesting that these elements are adequately managed but have a reduced direct impact on sustained usage. Similar to how Social Influence

(gray triangle) and Perceived Trust (light purple circle) fall into the moderate range for both importance and performance, indicating potential for improvement, Facilitating Conditions (cyan diamond) and Performance Expectancy (pink square) perform adequately but show limited influence. In order to increase the long-term usage of QR MPS in informal and underdeveloped urban markets, the IPMA emphasizes the strategic importance of concentrating on User Satisfaction, Attitude, and Personal Innovativeness.

Table 10 Importance performance matrix analysis

Constructs	Total Effect (Importance)	Index Value (Performances)
ATT	0.285	63.844
C	0.065	73.631
EE	0.05	69.567
FC	0.063	64.388
PE	0.023	63.885
PI	0.147	63.237
PT	0.06	60.063
SI	0.108	60.259
User Satisfaction	0.179	61.802

5.0 Discussion

This study highlights the complex effects of both technological and psychosocial factors and offers crucial insight into the continued use of QR code mobile payment systems by underprivileged women street vendors. The findings highlight the significance of performance expectancy, effort expectancy, social influence, enabling circumstances, individual inventiveness, perceived trust, and convenience in shaping user attitudes and satisfaction two crucial elements for sustained engagement.

Because providers associate QR payments with increased operational effectiveness, including quicker transactions, secure payments, and better business management, performance expectancy has a significant impact on user perceptions. However, its relatively limited impact on long-term satisfaction suggests that while these operational benefits may encourage initial use, they might not guarantee continued engagement. Vendors' expectations go beyond basic functionality as they grow more comfortable with QR systems, underscoring the need for ongoing technological improvements like improved user interfaces, attentive customer service, and tailored features to guarantee satisfaction and loyalty. This is consistent with the Expectation Confirmation Theory (ECT), which emphasizes that if the system consistently meets or exceeds user expectations determines whether or not it will be used going forward.

Effort expectancy has a significant impact on attitudes and user happiness, which emphasizes the need for user-friendly interfaces designed for vendors with little experience with technology, encouraging adoption and continued use. Similar to this, social impact and favorable circumstances are crucial, improving QR system perception and sustained satisfaction by offering robust community support and enough infrastructure. The findings are consistent with those of previous research. Making a good first impression and increasing long-term satisfaction with QR systems are greatly aided by creativity and community trust. In particular, trust gives merchants the assurance that QR payments are reliable and secure, which is crucial for further adoption. Convenience has a significant impact on customer satisfaction and perceptions, which emphasizes the necessity of QR systems that successfully streamline transaction procedures.

Additionally, the data confirms that user attitude and happiness are important markers of continued engagement, indicating that the positive perceptions and tangible benefits of using QR payment systems are

critical to their continued use. By integrating these sellers into the digital economy, this ongoing engagement is crucial for advancing financial inclusion. In addition to making transactions easier, QR payments give businesses access to more extensive financial services including credit choices and microfinance, which are essential for their stability and economic independence.

Women sellers' independence and decision-making skills are significantly increased by the use of QR payment systems, which promotes their social and economic progress. In order to support entrepreneurship and long-term economic growth among underrepresented women, these technologies facilitate more frictionless transactions and improve access to digital financial services. Ultimately, continued use of QR payment systems fosters broader socioeconomic benefits, such as increased participation in the formal economy and digital financial knowledge. The widespread adoption of QR code mobile payment systems can significantly reduce the gender gap in financial access and promote equitable community development, demonstrating these technologies' transformative potential in boosting financial inclusion and empowering marginalized women street vendors.

6.0 Conclusion

This research highlighted the important role various factors have in shaping the attitudes, user satisfaction, and sustained engagement of marginalized women street vendors with QR code mobile payment systems, such as performance expectancy, effort expectancy, social influence, facilitating conditions, personal creativity, perceived trust, and convenience. It highlighted that providing these vendors with entry to the digital economy fosters financial inclusion, empowerment, and business efficiency. The findings underscore the ability of QR payments to change economic dynamics for disadvantaged communities and promote wider societal advantages, stressing the importance of supportive infrastructures, accessible technologies, and dependable systems to guarantee their extensive acceptance and continuous utilization

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