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Payment Innovations (QR & Instant Systems): A Bibliometric Mapping

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ABSTRACT

This study conducts a bibliometric analysis of QR and instant payment systems, focusing on their transformative impact on the financial ecosystem. Using data from Scopus and Web of Science, the research identifies key trends, influential publications, and the interconnections among authors and institutions in the field of payment innovations. QR codes and mobile payment systems have rapidly gained traction due to their efficiency, security, and ability to foster financial inclusion, particularly in regions with high smartphone penetration but limited traditional banking access. The study also explores emerging technologies such as blockchain, artificial intelligence, and machine learning, emphasizing their role in enhancing the security and functionality of digital payments. Despite the growing body of literature, the study highlights the need for further research on the global dynamics of QR and instant payment adoption and provides insights for policymakers and financial institutions to facilitate the transition to a digital-first payment ecosystem.

Keywords: *QR Codes, Mobile Payment Systems, Instant Payments, Payment Innovations, Digital Payments*

1. INTRODUCTION

The digital era has transformed the landscape of financial transactions, ushering in an era of payment innovations that have revolutionized the way individuals and businesses exchange value. Traditional payment systems, such as cash and card-based mechanisms, have gradually given way to more sophisticated digital alternatives that offer speed, convenience, and enhanced security [1], [2]. Among these innovations, Quick Response (QR) codes and instant payment systems have emerged as prominent solutions, facilitating seamless peer-to-peer and business-to-consumer transactions. These mechanisms leverage mobile technology and real-time processing to enable instant fund transfers, thereby reducing dependency on conventional banking infrastructure and improving transactional efficiency [3].

QR code-based payments, in particular, have gained substantial traction due to their simplicity and accessibility. By scanning a QR code through a smartphone application, users can instantly complete a payment without the need for physical cards or cash. This method has proven especially effective in regions with high smartphone penetration but limited access to traditional banking services, bridging gaps in financial inclusion [4]. Furthermore, QR payments reduce transaction costs for merchants by minimizing the need for expensive Point-of-Sale (POS) devices, offering a low-cost alternative for small businesses to integrate digital payments into their operations.

Instant payment systems, on the other hand, have redefined the concept of transaction speed by enabling near real-time clearing and settlement of funds. Unlike traditional electronic funds transfers, which may take hours or even days, instant systems operate on continuous, round-the-clock processing platforms that ensure immediate transfer of value between parties [5], [6]. These systems are increasingly being adopted by banks, fintech companies, and central banks worldwide, with national payment infrastructures such as Faster Payments in the United Kingdom, RTP in the United States, and UPI in India serving as prominent examples of large-scale deployment. The

implementation of instant payment networks not only enhances consumer convenience but also facilitates liquidity management for businesses by accelerating cash flow cycles.

The proliferation of QR and instant payment systems has been accelerated by the global COVID-19 pandemic, which underscored the need for contactless, secure, and efficient payment methods. Lockdowns and social distancing measures significantly curtailed the use of physical cash, prompting a surge in digital payment adoption across both developed and developing economies [7]. Governments and financial institutions have also actively promoted these innovations as part of broader strategies to modernize payment infrastructure, stimulate digital economies, and reduce reliance on cash transactions. Consequently, QR and instant payments are no longer niche solutions but have become integral components of contemporary financial ecosystems.

From an academic perspective, understanding the development, diffusion, and impact of payment innovations requires systematic mapping of the existing literature. Bibliometric analysis provides a robust methodology to examine patterns of research, identify influential authors and publications, and uncover emerging trends within a scientific domain [8]. In the context of payment innovations, such mapping can reveal how QR and instant payment systems are being studied across disciplines, highlight key research themes, and identify gaps where further investigation is warranted. Bibliometric techniques, including co-citation analysis, co-authorship networks, and keyword co-occurrence mapping, allow researchers to visualize the intellectual structure and evolution of this rapidly expanding field.

Despite the growing body of literature, there remains a need for comprehensive studies that systematically synthesize knowledge on QR and instant payment systems from a global perspective. Current research often focuses on case studies, technical implementation, or regional adoption patterns, leaving a fragmented understanding of the broader academic discourse [9], [10]. A bibliometric approach not only consolidates existing knowledge but also facilitates evidence-based insights for policymakers, financial institutions, and researchers seeking to explore innovation pathways, adoption challenges, and technological trends. By mapping the scholarly landscape, this study contributes to a more holistic understanding of payment innovations and their transformative role in modern financial ecosystems.

Although QR and instant payment systems have witnessed rapid adoption and technological advancement, the literature on these innovations remains fragmented, with limited studies systematically analyzing the evolution, interconnections, and thematic concentrations of scholarly research. Existing studies often emphasize isolated regional contexts or specific technical aspects, failing to provide a comprehensive global overview that highlights influential research, emerging trends, and potential research gaps. This lack of holistic insight hampers the ability of researchers, practitioners, and policymakers to understand the full scope of payment innovations, their impact on financial systems, and future directions for research and practice [11], [12]. The objective of this study is to conduct a bibliometric mapping of QR and instant payment systems to identify research trends, influential publications, key authors, and thematic patterns within the scholarly literature.

2. METHODS

This study employs a bibliometric research design to systematically analyze the scholarly literature on QR and instant payment systems. Bibliometric analysis is a quantitative method that

examines the distribution, structure, and patterns of academic publications to identify trends, influential works, and research gaps [13]. By mapping the intellectual landscape, this approach allows researchers to uncover the evolution of a scientific field and visualize relationships between authors, publications, and keywords. The study focuses on publications from peer-reviewed journals, conference proceedings, and authoritative sources within the field of digital finance, fintech, and payment innovations.

Data collection was carried out using Scopus, ensuring comprehensive coverage of publications relevant to QR and instant payment systems. Keywords such as "QR payment," "instant payment system," "digital payment innovation," and "mobile payments" were employed to retrieve publications from 2010 to 2025. The inclusion criteria were limited to English-language publications that specifically addressed technological, operational, or adoption aspects of QR and instant payments. After data extraction, bibliographic information including authorship, publication year, source title, keywords, and citations was imported into bibliometric software for analysis. This allowed the construction of co-authorship networks, keyword co-occurrence maps, and citation analyses to visualize research trends and identify influential contributors

Data analysis was conducted using VOSviewer which facilitated network visualization and quantitative evaluation of publication patterns [14]. Co-citation and co-authorship analyses were performed to determine the most influential authors, institutions, and countries in the domain of payment innovations. Additionally, keyword co-occurrence and thematic mapping were used to identify prevailing research topics, emerging themes, and potential gaps in the literature.

3. RESULTS AND DISCUSSION

3.1 Network Visualization

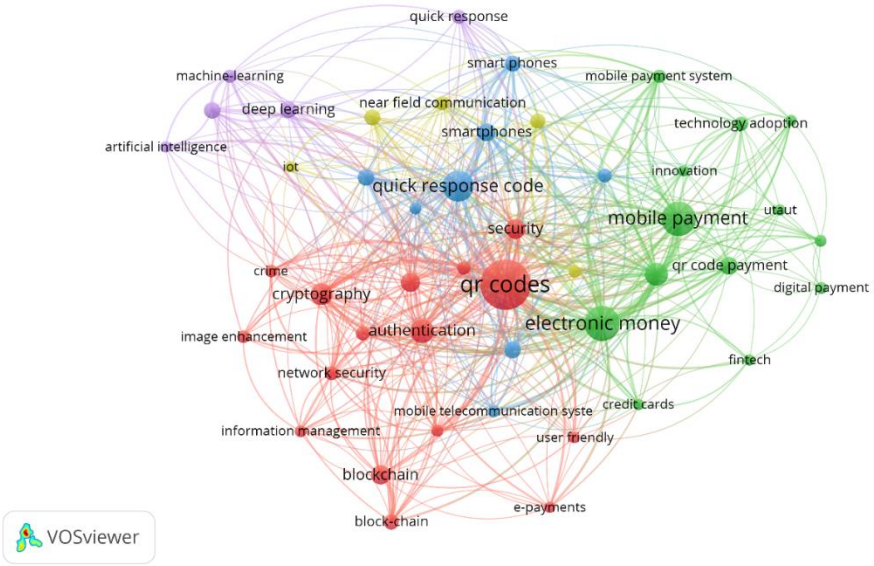

Figure 1. Network Visualization
Source: Data Analysis Result, 2025

Figure 1 illustrates the interconnectedness of key concepts related to payment innovations, specifically focusing on QR codes, mobile payment systems, and electronic money. At the center of the map, QR codes emerge as the most prominent term, highlighted in red, with several other associated terms clustering around it. These connections represent the various fields of research and technological advancements tied to QR codes in the payment ecosystem. The relationships between these terms suggest a growing body of work focused on integrating QR codes with mobile payment platforms, emphasizing ease of use, security, and broader financial technology trends.

The mobile payment cluster, marked in green, is another central theme on the map. It links directly to the concepts of electronic money, digital payments, and QR code payment. The prominence of mobile payments reflects their rapid adoption globally, spurred by the increasing usage of smartphones and the need for contactless, digital transaction methods. This network reveals the evolution of traditional payment methods towards more efficient, digital-first approaches, with mobile payment systems being central to this transition. Security-related terms form another significant cluster on the map, where authentication, cryptography, and network security play key roles. These are tightly connected to QR codes and mobile payment systems, highlighting the critical need for secure transaction methods as digital payments become more prevalent. The map suggests that as the use of QR codes and mobile payments increases, so does the emphasis on ensuring that these transactions are protected against fraud and cyberattacks, with blockchain technology also mentioned as a potential solution for enhancing security.

Emerging technologies such as machine learning, deep learning, and artificial intelligence are represented by the purple cluster, indicating their growing importance in the payment landscape. These technologies are likely being explored to enhance the functionality of mobile payment systems and QR code-based transactions. For example, AI and machine learning can be used to improve fraud detection, personalize user experiences, and optimize the performance of payment systems. The convergence of these technologies with mobile payments suggests a trend towards smarter, more adaptive financial systems. The map shows terms related to the broader context of fintech, credit cards, and user-friendly interfaces. These elements underscore the integration of traditional financial services with new, digital-first solutions. The emphasis on user-friendly experiences suggests that for mobile payments and QR code systems to gain wider adoption, they must be intuitive and accessible.

3.2 Overlay Visualization

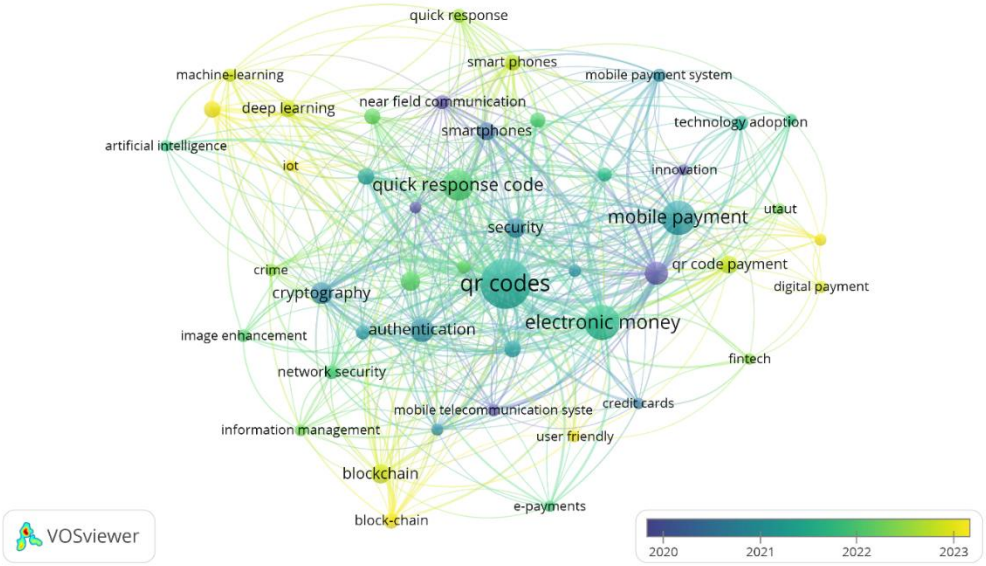

Figure 2. Overlay Visualization
Source: Data Analysis Result, 2025

Figure 2 introduces a timeline element, color-coded from 2020 to 2023, to highlight the evolution of research in payment innovations, specifically QR codes, mobile payments, and electronic money. The nodes are color-coded according to their publication year, with recent research (2022-2023) being represented in shades of blue and green, while older research (2020) is shown in yellow. This color gradient reveals trends in the popularity and focus of specific topics over the past

few years. Notably, the concepts of QR codes, mobile payments, and electronic money are central and exhibit an increasing number of connections, demonstrating their rising importance in payment technology research.

Looking at specific trends, QR codes and mobile payment systems appear to have seen an increase in scholarly attention starting around 2021, as indicated by the blue and green nodes surrounding these terms. These technologies, positioned at the core of the map, are strongly connected to concepts like security, authentication, and blockchain, suggesting that recent research has prioritized the integration of secure and innovative payment solutions. The terms associated with security and cryptography are more prominent in the latter years, indicating the growing concerns around securing mobile and QR-based transactions as they become more widespread in the digital payment landscape. In contrast, earlier research (2020) focused more on foundational technologies such as machine learning, deep learning, and artificial intelligence, indicated by the yellow nodes. These fields are now linked to payment systems research, reflecting a growing trend to incorporate advanced technologies for improving mobile payment experiences and ensuring their scalability.

3.3 Citation Analysis

Table 1. The Most Impactful Literatures

Citations	Authors and year	Title
375	[15]	Mobile payment is not all the same: The adoption of mobile payment systems depending on the technology applied
195	[16]	QR code and mobile payment: The disruptive forces in retail
160	[17]	User behaviour in QR mobile payment system: the QR Payment Acceptance Model
148	[18]	High speed rail passengers' mobile ticketing adoption
76	[19]	The impact of digital financial inclusion on carbon dioxide emissions: Empirical evidence from Chinese provinces data
73	[20]	Understanding user acceptance of QR code mobile payment systems in Turkey: An extended TAM
68	[21]	Factors affecting the use of facial-recognition payment: An example of Chinese consumers
68	[22]	SBVLC: Secure barcode-based visible light communication for smartphones
61	[23]	Tourist satisfaction enhancement using mobile QR code payment: An empirical investigation
55	[24]	The moderating influence of brand image on consumers' adoption of QR-code e-wallets

Source: Scopus, 2025

Table 1 showcases some of the most impactful literatures in the field of mobile payment systems, particularly focusing on QR codes, mobile payment adoption, and technological innovations. The most cited paper, by [17], examines the varying adoption of mobile payment systems depending on the technology applied, with 375 citations. This highlights the diverse approaches to mobile payments, emphasizing the importance of understanding how different technologies impact consumer adoption. [16], with 195 citations, explores QR code and mobile payments as disruptive forces in retail, reflecting the growing relevance of these technologies in transforming consumer behavior in the retail industry.

A notable entry, [17] with 160 citations, introduces the QR Payment Acceptance Model, which investigates user behavior in the adoption of QR mobile payment systems. This study is crucial for understanding the factors influencing consumer decisions when using QR code-based payments. Similarly, [18], with 148 citations, focuses on mobile ticketing adoption among high-speed

rail passengers, contributing to the broader understanding of mobile payment applications in transportation sectors. Recent studies also reflect evolving trends in digital financial systems. For instance, [19], with 76 citations, investigates the impact of digital financial inclusion on carbon dioxide emissions, linking financial technologies to environmental sustainability. On a more localized level, [20] (73 citations) explores user acceptance of QR code mobile payment systems in Turkey, extending the Technology Acceptance Model (TAM), a common framework used to measure user adoption of new technologies. These studies reflect the growing importance of context-specific factors, such as user behavior and socio-economic contexts, in the adoption of payment technologies globally. The work of [23](61 citations) on tourist satisfaction enhancement using QR code payments and [24] (55 citations) on brand image's influence on QR-code e-wallet adoption, further highlight the consumer-centric focus of current research in this field.

3.4 Density Visualization

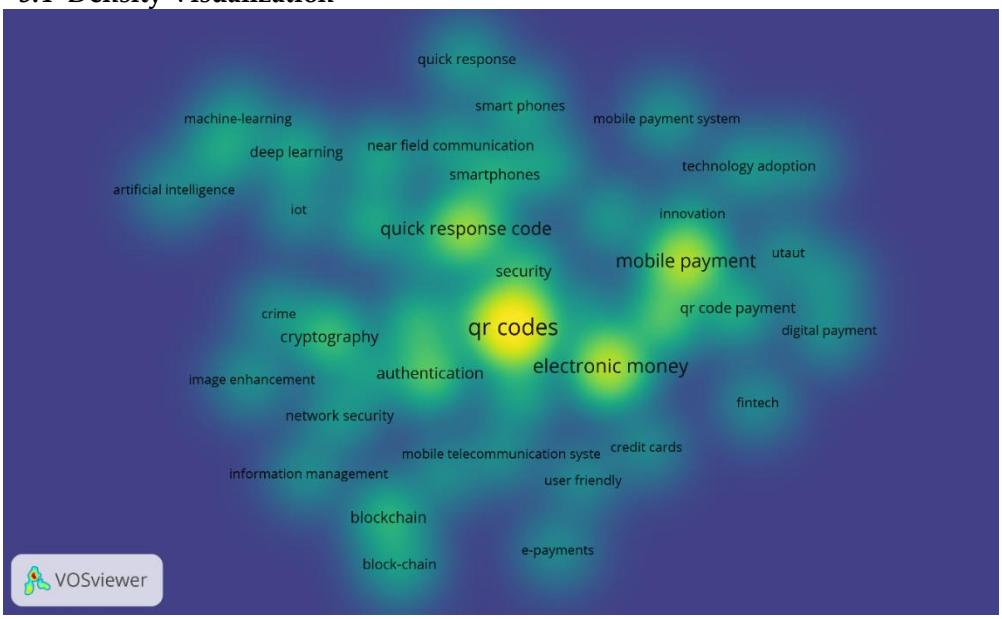

Figure 3. Density Visualization
Source: Data Analysis Result, 2025

Figure 3 highlights the concentration of research topics in the field of payment innovations, particularly focusing on QR codes, mobile payment systems, and electronic money. The brightest areas, centered around QR codes, indicate the most discussed and explored concepts within this domain, with terms like security, authentication, and mobile payment closely clustered around it. These key themes suggest that QR code-based systems are a focal point of research, emphasizing the importance of security features and user-friendly interfaces. The surrounding clusters on the map show emerging areas such as blockchain, artificial intelligence, and technology adoption, indicating that cutting-edge technologies are being integrated with mobile payments to enhance efficiency, security, and overall user experience.

3.5 Co-Authorship Network

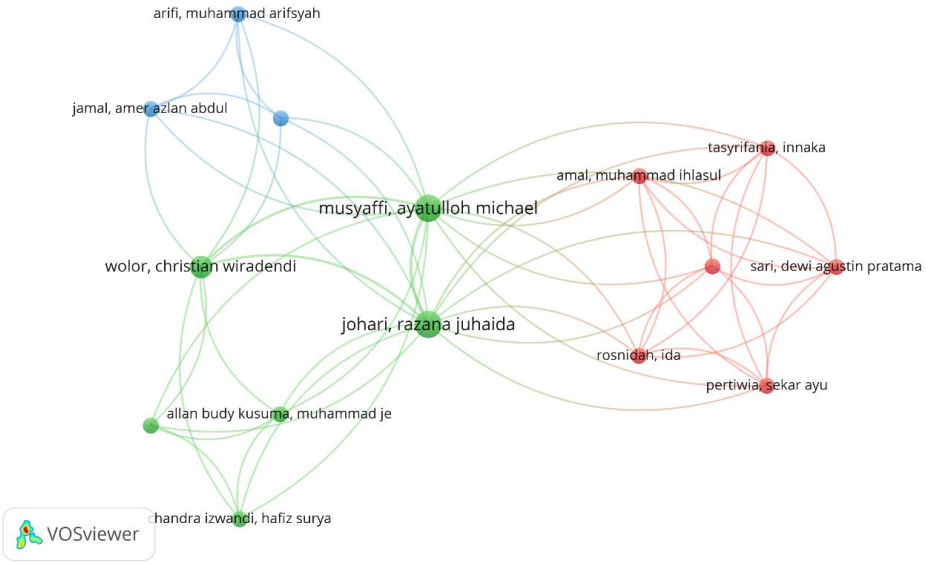

Figure 4. Author Visualization
Source: Data Analysis Result, 2025

Figure 4 reveals the collaboration patterns among a set of authors, with nodes representing individual authors and edges indicating co-authorship connections. The color of the nodes and edges reflects different groups of authors, with green representing one cluster of closely linked authors, blue indicating another group, and red showing yet another distinct set. Authors in the green cluster, such as Johari, Razana, and Michael, have multiple co-authorship ties within their group, suggesting active collaboration. Similarly, the blue and red clusters, consisting of authors like Jamal, Tasyrifania, and Sari, display less dense, but still notable, collaboration links within their respective groups. This map illustrates how these authors are interconnected, reflecting their research collaboration networks.

Figure 5. Affiliation Visualization
Source: Data Analysis Result, 2025

Figure 5 displays the collaboration patterns between different institutions, with each node representing an entity such as a university or organization. The green node, representing G.O.S.S.I.P, has a connection with the blue nodes of National Taiwan University and Shanghai Jiao Tong University, indicating collaboration within academic or research projects. The red node, representing Bosch Future Intelligent Drive, shows a distinct connection to Shanghai Jiao Tong University, which highlights a partnership between a university and an industrial entity. The map suggests that the academic institutions are mainly interacting with each other, while Bosch's involvement brings in an industrial research perspective, emphasizing the interdisciplinary nature of these collaborations in fields such as technology and intelligent systems.

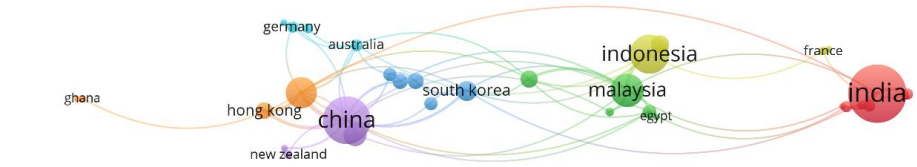

Figure 6. Country Visualization
Source: Data Analysis Result, 2025

Figure 6 maps the global collaboration or association between various countries, with each node representing a country. The red node for India stands out, having multiple connections to countries like Malaysia, Indonesia, and Egypt, highlighting a strong regional network. Similarly, China (represented by a purple node) forms a significant connection hub, linked with Hong Kong, South Korea, Australia, and Germany. These connections suggest an active collaboration or influence within East and Southeast Asia, extending to regions like Europe and Australia. France is also positioned near the India node, reflecting its connections in the network. The map highlights how countries in Asia, particularly China and India, are central to this global network, with numerous ties across continents. The orange cluster around Hong Kong and China contrasts with the green, blue, and red clusters, pointing to regional dynamics within the broader global exchange.

Practical Implication

The findings of this study on payment innovations, particularly QR codes and mobile payment systems, have significant practical implications for both businesses and policymakers. As QR code adoption grows globally, the integration of mobile payment systems provides businesses with an opportunity to streamline transactions, reduce operational costs, and enhance customer convenience. In retail, tourism, and other service industries, understanding the factors that drive user acceptance of these systems, such as security, ease of use, and brand trust, can help businesses optimize their payment infrastructure. Additionally, the research suggests that firms looking to adopt QR code and mobile payment technologies should prioritize security features and a user-

friendly interface to increase consumer confidence and adoption rates. Policymakers can also use these insights to create regulatory frameworks that ensure the security and privacy of digital transactions, which is crucial for fostering trust in emerging payment systems.

Theoretical Contribution

This study makes several theoretical contributions to the field of digital payments and financial technology (fintech). It expands upon existing models of technology adoption, particularly the Technology Acceptance Model (TAM), by incorporating factors like security and brand image, which are crucial to consumer decision-making in mobile payment systems. The study also introduces new insights into how QR codes are transforming mobile payment systems, offering a more secure and efficient method for transactions in various sectors. The findings contribute to understanding the role of blockchain and cryptography in enhancing the security of these payment methods. Furthermore, the integration of emerging technologies such as artificial intelligence and machine learning is explored, proposing new avenues for improving fraud detection and user personalization within payment systems. This research adds to the literature by offering a comprehensive view of how various technological advancements intersect with mobile payments, enriching the theoretical framework in the payment innovation field.

Limitation

While this study provides valuable insights, it has several limitations. First, the research focuses primarily on existing models of mobile payment adoption and does not include longitudinal data to examine how consumer behavior evolves over time with the adoption of these technologies. Future studies could expand on this by tracking the long-term adoption and usage patterns of QR codes and mobile payments in various industries. Additionally, the research is based on secondary data from existing studies and bibliometric analysis, which limits the depth of primary qualitative insights from actual users. Conducting surveys or interviews with consumers and businesses involved in mobile payment systems would provide richer data for understanding the practical challenges and user experiences. Lastly, while the study covers a broad range of geographical regions, the cultural and economic factors influencing payment adoption may vary significantly between countries. A more detailed regional analysis could provide a better understanding of the global landscape of payment innovations.

CONCLUSION

This study highlights the transformative impact of QR codes and mobile payment systems on the global financial ecosystem, emphasizing their rapid adoption and the evolving role of security, technology, and user experience in driving consumer acceptance. The findings underscore the critical importance of integrating advanced technologies such as blockchain, artificial intelligence, and machine learning to enhance the security and functionality of digital payment systems. This research also contributes to the theoretical understanding of technology adoption, offering new perspectives on the factors influencing the success of mobile payments. While the study provides valuable insights, it also reveals the need for further research, particularly longitudinal studies and primary data collection, to better understand the long-term dynamics and regional variations in mobile payment adoption.

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