future internet

MDPI

Review

The Emerging Technologies of Digital Payments and Associated Challenges: *A Systematic Literature Review*

Khando Khando, M. Sirajul Islam and Shang Gao *

Department of Informatics, School of Business, Örebro University, 70182 Örebro, Sweden
* Correspondence: shang.gao@oru.se

Abstract: The interplay between finance and technology with the use of the internet triggered the emergence of digital payment technologies. Such technological innovation in the payment industry is the foundation for financial inclusion. However, despite the continuous progress and potential of moving the payment landscape towards digital payments and connecting the population to the ubiquitous digital environment, some critical issues need to be addressed to achieve a more harmonious inclusive and sustainable cashless society. The study aims to provide a comprehensive literature review on the emerging digital payment technologies and associated challenges. By systematically reviewing existing empirical studies, this study puts forward the state-of-the-art classification of digital payment technologies and presents four categories of digital payment technologies: *card payment*, *e-payment*, *mobile payment and cryptocurrencies*. Subsequently, the paper presents the key challenges in digital payment technologies categorized into broad themes: *social*, *economic*, *technical*, *awareness and legal*. The classification and categorization of payment technologies and associated challenges can be useful to both researchers and practitioners to understand, elucidate and develop a coherent digital payment strategy.

Keywords: digital payment technology; digital payment system; mobile payment; e-payment; cryptocurrency; card payment; challenges; systematic review

Citation: Khando, K.; Islam, M.S.; Gao, S. The Emerging Technologies of Digital Payments and Associated Challenges: *A Systematic Literature Review*. *Future Internet* **2023**, *15*, 21. https://doi.org/10.3390/fi15010021

Academic Editor: Wolf-Tilo Balke

Received: 9 November 2022
Revised: 20 December 2022
Accepted: 26 December 2022
Published: 30 December 2022

1. Introduction

Modern-day transactions are constantly shifting from cash-based transactions to those that are electronic-based. The ubiquitous connectivity of ICT contributes enormously to the transformation of the financial business market and their operations [1]. The trend towards digitalization and the use of the internet has brought about major changes in the ways the global economy functions. The emergence of a broad range of financial technology (FinTech) applications enables consumers to move beyond the conventional cash-based payment system. Digital payments are becoming the norm in people's daily lives. These rapid developments in the financial sector lead to the invention of many digital payment technologies, through which payers and payees both use digital apps to send and receive money. Thus, the payment system is rapidly changing from coin-based and paper-based money to digital forms of payments that are convenient, fast and cost effective [2].

The COVID-19 pandemic brought the payment industry to this new normal. The pandemic escalated the use of digital payments and pushed industries to higher levels of collaboration and innovation. According to the world payment report 2020 [3], the increasing usage of non-cash transactions is questioning the future of cash as a payment. As per the report, global non-cash transactions grew more than 14% in 2019, the highest in the past few decades, to reach over 708 billion transactions [3]. Subsequently, in 2020, the digital payment portion of all transactions had a global transaction value of USD 5204 billion and is the largest segment within FinTech, as per the digital payment report 2021 [4]. As COVID-19 accelerates the digital shift, new regulatory initiatives and industry changes are fostering innovation, which is boosting trust, increasing collaboration and

stemming pandemic-driven uncertainty. The payment industry is rapidly prioritizing digital transformation to stay competitive [3]. Therefore, as firms embrace these new changes, we will become more engaged and aligned with their customer payment journeys.

The benefits of using digital payment technologies go beyond convenience. Digital payments expand the potential customer base for merchants, reduce cash-handling costs and bring many informal shadow economies to the fore, increasing tax revenues for governments. All of these factors and other advantages of using digital payment technologies can help in reducing economic friction [5]. As a result, overall spending and consumption will be increased, leading to greater production, an increased number of jobs, higher wages and economic growth [6]. However, despite the numerous benefits, there are a lot of challenges associated with digital payment technologies. For example, the payment industry seems to be burdened with an increased risk of privacy [7], cybersecurity, fraud and other threats [8,9]. The security breaches and lack of knowledge about payment technologies among users are some of the primary concerns for individuals and organizations [10]. Furthermore, the need for infrastructure modernization and digital transformation has been highlighted together with a call for attention to banks' navigational strategies in light of new risks and 'unpredictable and unforeseen' situations, such as the COVID-19 pandemic [3].

Although there are many existing studies on digital payments addressing various issues (e.g., business model [11,12], technological infrastructure [13,14], technology adoption [15,16]), there is a lack of research, which provides a comprehensive synthesis and a universal classification of digital payment technologies and associated challenges. For instance, there are some forms of payment technologies referred to in previous studies [15,17,18]. Nevertheless, these studies concentrate on a single mode of payments. For example, the classification by Casino et al. [17] is on blockchain technology-based cryptocurrencies and Dahlberg et al. [18] is on mobile payments. Furthermore, the challenges associated were mostly mentioned as part of the adoption studies. For example, Ahmad and Hamzah [15] emphasized challenges in mobile payment technologies in emerging economies and Kabir et al. [19] studied issues related to the adoption of e-payment systems. Thus, this study aims to bridge these gaps, provide an overall picture and a state-of-the-art overview of the widely dispersed knowledge on the emerging digital payment technologies and their challenges and answer the two overarching research questions: *(1) What are the emerging digital payment technologies and (2) what are the challenges associated with them?*

The remainder of this paper is organized as follows. The next section presents the research background, including the definition of digital payment technology and other related terms used in the review context, as well as related work, which identifies the research gap and rationale for this review. The methodology is covered in Sections 3 and 4 is devoted to the findings and discussions. In Section 5, the limitations of the study with some recommendations for further work are presented and Section 6 contains the conclusion.

2. Research Background

2.1. Digital Payment and Digital Payment Technologies

Digital payment refers to transactions that occur through digital or online means without physically exchanging cash. The payer and payee both use a digital medium for the transaction, for example, making payments for your purchase using a mobile device (smart phone) via wireless connection or other communication technology means [18]. Digital payment also refers to electronic transactions that take place via the internet, e.g., payment by credit or debit card, whether online or in person at a supermarket or another shop [20]. It also includes payments made through cryptocurrencies, such as bitcoin, which facilitates an encrypted, peer-to-peer digital barter [21].

The digital payment services are made possible through digital payment technologies. The technologies used for digital payment transactions include e-payment technologies, such as eChecks and BNPL solutions (Buy Now, Pay Later), which initiate transactions between parties digitally. With online shopping gaining popularity, e-payment technologies are the most-used payment technologies. Similarly, card payment technologies include credit and

debit cards that can be used both online and in person and can include the use of Near-Field Communication (NFC) chips when used in person. Touch-free payment using NFC enables connection between two electronic devices over a short distance. This contactless payment has become more popular due to its convenience, speed and reliability, and has proved more useful during the pandemic because of health restrictions and safety precautions [22]. Other popular payment technologies include mobile payments, e.g., mobile e-wallets, such as Apple Pay, PayPal, Samsung Pay and Google Pay. These are virtual wallets, which provide great convenience and more secure financial services to the consumers. Similarly, cryptocurrencies are another form of emerging digital payment technology. For example, the blockchain-based cryptocurrency 'bitcoin' has the potential to revolutionize the digital financial market by creating a free-flowing trading system without fees [21].

The 'emerging digital payment technologies' in this study context refer to the digital payment systems or digital payment methods or technologies used to make payments for transactions. They are relatively new and characterized by persistent growth over time with potential socio-economic impacts. Thus, the use of these digital payment technologies generally will yield benefit for the wider population at large [23].

2.2. Related Work

The related work in this research was explored in order to spot the research gap in the existing literature (see Table 1). Similar to this review study, Diniz et al. [24] carried out an extensive literature review of 192 papers to synthesize knowledge about actors and institutions of mobile payment technologies. Similarly, Karsen et al. [25] conducted a review on the key technological factors related to mobile payments. Their study identified 17 key technological factors for using mobile payment technologies. Another review study by Dahlberg et al. [18] focused on the past, present and future of mobile payment technology. They focused on the impacts of the social and cultural aspects of mobile payment methods. The study also included comparisons between mobile and traditional payment services. Ahmad and Hamzah [15] reviewed a growing volume of studies on mobile e-wallet adoption in developing countries. The study found that electronic wallets have emerged as one of the most popular digital payment methods and gained more attention from researchers. Kabir et al. [19] reviewed 51 papers on e-payment adoption and highlighted the use of scope, methodology and information system models.

Table 1. Previous reviews vs. this review.

Review by	No. of Papers	Focus of the Study
Our review (2021)	58	Emerging technologies of digital payment and challenges associated with them
Ahmad and Hamzah [15]	77	Mobile e-wallet in emerging economies
Kabir, Saidin and Ahmi [19]	51	Adoption of e-payment systems
Casino, Dasaklis and Patsakis [17]	54	Applications related to blockchain technology
Diniz, Porto and Cernev [24]	192	Mobile money and payment
Dahlberg et al. [18]	73	Past, present and future of mobile payment technology
Patil, Dwivedi and Rana [26]	21	Adoption of digital payment technologies
Karsen, Chandra and Juwitasary [25]	54	Technological factors of mobile payment

Casino et al. [17] conducted a review of 54 papers concerning blockchain-enabled applications. The study included a systematic classification of applications related to blockchain technology and established trends and key areas of research. Their study highlighted the potential disruption of blockchain technology to revolutionize 'business-as-usual' practices. Another study by Patil et al. [26] explored 21 articles to determine factors

influencing the adoption of digital payments, showing the drivers and inhibitors for the adoption of the digital payment technologies.

As mentioned above, the previously published literature reviews were mostly focused on the adoption of digital payment technologies, such as the adoption of e-payment systems and mobile e-wallet payment methods' adoption in developing countries. The previous reviews also focused on a particular technology used for digital payments, such as blockchain-based applications, mobile money, e-wallet and mobile payments. In contrast, this paper provides a systematic summary of the widely dispersed knowledge on emerging technologies used in digital payment systems. Digital payments occur through a variety of technologies, such as debit cards, credit cards, ATMs, online transactions and mobile phones. Through a systematic literature review (SLR) of empirical studies on digital payments, the paper aims to map out the existing knowledge on emerging digital payment technologies and the challenges associated with them.

3. Methodology

To provide a systematic, transparent and reproducible literature review of digital payment technologies, the 8-step guidelines suggested by Okoli and Schabram [27] for conducting a systematic literature review of information system research were followed. The step-by-step review process is as Figure 1:

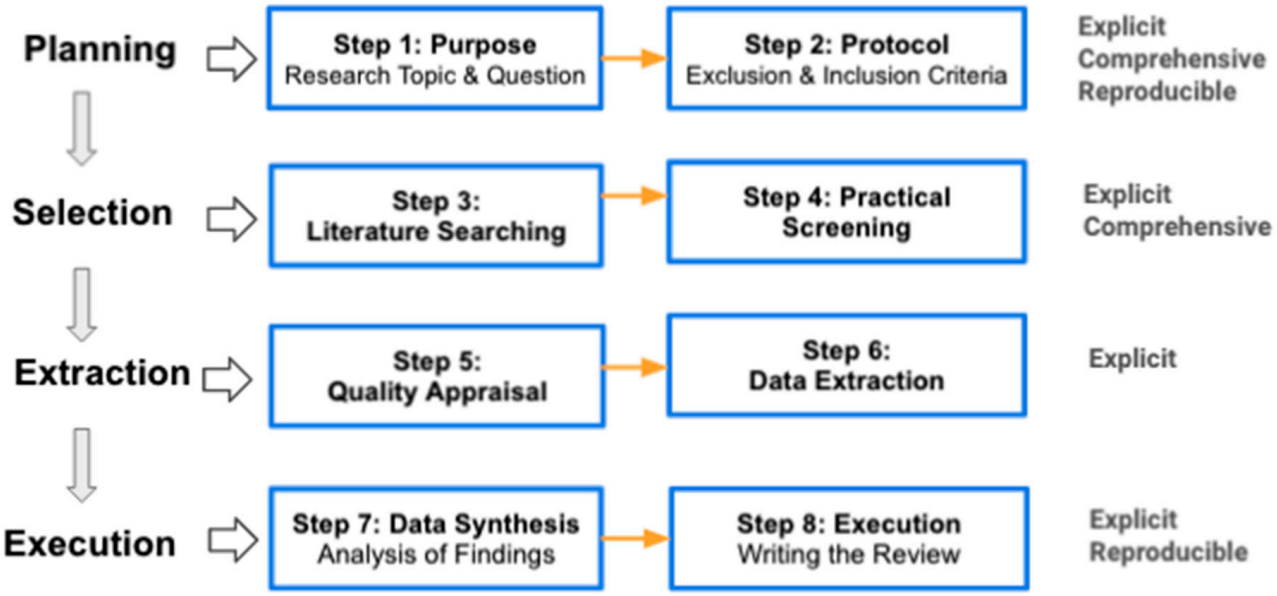

Figure 1. Illustrating Systematic Review Process (Okoli and Schabram, 2010).

Step 1: Purpose—The purpose of this research was to synthesize the existing empirical knowledge on the emerging digital payment technologies and associated challenges.

Step 2: Protocol—Predefined eligibility criteria were set before the initial 'search process' (step 3). The protocol consists of the 'inclusion and exclusion' criteria. The articles meeting the delimitation criteria are to be included for the review (e.g., articles written in English, published journal articles and conference proceedings), whereas articles written in languages other than English, research in progress or 'articles in press' are to be excluded based on the criteria set in Table 2.

The study includes only empirical articles; thus, conceptual papers, such as literature reviews and book chapters, are to be excluded. However, the insights gathered from those articles are considered in the theoretical background of the study.

Step 3: Literature Search—This step shows the search process and initial selection of papers, including the keywords and databases used, the applied delimitation criteria set in Table 2 above and the number of articles found through the search process (see Table 3). The

literature search was carried out in August 2021. We searched two main databases—'Web of Science' (WoS) and 'Scopus'—with the keywords identified in Table 3. The keywords were searched in the articles' titles, abstracts and keywords. As defined in step 2 (protocol), only peer-reviewed scholarly articles from journals and conferences were considered, with no date restrictions. The search was not limited by date because although the field of study is growing and digital payment technologies are changing rapidly to cope with the latest challenges, there is a lack of relevant empirical studies on this overarching topic.

Table 2. Inclusion and exclusion criteria.

Selection Criteria	Eligibility Criteria
Inclusion	Empirical studies only: Peer-reviewed research articles (final stage), conference proceedings and reviewed papers (in English language) Without time-frame restrictions
Exclusion	During title screening and prior to downloading the article - Non-English articles, articles with missing abstracts, articles in press During abstract screening - Literature review articles (secondary source), inaccessible to full text During full-text screening - Conceptual papers and book chapters

Table 3. The searching and selection process.

Keywords Searched	Database	Delimitation Criteria	No. of Papers
"digital payment" AND "digital payment system" OR "digital payment" AND emerging AND technology OR "digital payment"AND risks OR "digital payment"AND challenges	Web of Science	**Publication stage:** Final **Publication years:** No time-frame restrictions **Document types:** (Journal Articles and proceeding reviewed papers) **Language:** (english)	37
	Scopus		106
Total			143
Subtracted "Papers with no full text access"			−21
Subtracted "Duplications"			−22
Total articles retrieved through the search process (downloaded for reading)			**100**

The initial search was conducted in the WoS database as it is known for its in-depth coverage of peer-reviewed articles with high-quality content [28]. The WoS search was supplemented by searching the Scopus database, which offers a wider range of journal articles compared to WoS [28]. Through the initial search process, 143 articles were retrieved. We then compiled the articles from both the databases and found 22 duplicates and 21 articles without full-text access. After subtracting the duplicates and no-full-text-access articles, we were left with a total of 100 articles, as shown in Table 3 above.

Step 4: Practical Screen—The 100 articles obtained via the 'literature search' step above were then put to practical screening by carefully reading the 'abstract' of each article. The articles were screened out based on content applicability with regard to the research questions. This step is to refine the searched articles so that the study is practically manageable [27]. The generalized studies related to digital payment technology with no information on

specific applications, published book chapters, lecture notes and grey literature, such as company reports, working papers and government documents, were excluded. In total, 26 articles were weeded out in this step and only 74 articles were considered for quality screening in the next step (see Table 4).

Table 4. Articles selected through (Step 4 and 5)—practical and quality screening.

Article from Search Process	Practical Screening			Quality Screening		
	Eligibility Criteria	Articles Screened-Out	Articles Selected	Eligibility Criteria	Article Screen-Out	Article Selected
100	**Inclusion criteria:** ➢ Content applicable to the research question ➢ Studies related to digital payment technologies ➢ Articles on challenges associated with Digital payment technologies **Exclusion criteria:** ➢ Generic reports related to digital payment technology without describing the specific application ➢ Grey literature e.g., published book chapters, Lecture notes, ➢ No full-text access to some relevant papers, therefore excluded	26	74	**Inclusion criteria:** ➢ Empirical studies which use the appropriate methodology and data collection strategies ➢ Studies provide clear and valid practical and theoretical contributions ➢ Studies present quality arguments with reliability and validity. **Exclusion criteria:** ➢ Literature Review papers using secondary sources ➢ Conceptual papers which do not present original data ➢ The central statement lacks a sufficient quality of argumentation that contains fallacies.	22	52
				Articles selected through backward citation search		+6
				Total No. of empirical studies used for the review		**58**

Step 5: Quality Screen—The 74 eligible articles selected through the previous step were then screened for quality by closely reading through the content (full text) of each article. Since only empirical studies were included in this study to ensure the quality of the review, the quality screening mainly judged the methodological validity and reliability of the findings. Thus, the articles were screened out based on assessment of methodology employed in the study, including the data collection methods and findings [29]. For example, quantitative studies were assessed based on the reliability of the methodology, such as to check if the study applied acceptable statistical methods. For scoring qualitative studies, the guidelines from Hart [30] were used, which highlight the importance of argumentation analysis. The studies were examined on the basis of how the arguments were built and if the basis of the arguments was derived from inference, assertion or supposition [30]. Thus, the studies providing valid and quality arguments for their claims were included. Additionally, the articles' practical and theoretical contributions were assessed and studies with clear and valid contributions were included. As a result of this step, 22 articles were screened out and only 52 articles were selected for the final review. Further, 6 additional relevant articles were selected through backward citation searching and, in total, 58 empirical articles were finally confirmed and selected for the review (see Table 4).

Step 6: Data Extraction—With practical and quality screening completed, a final set of 58 articles was selected and confirmed for the review. After completing the reading, we started extracting the data from each article. The data extraction form (excel form), defined and piloted during the protocol (step 2), was used to record the data accurately [31]. The process for extracting and preparing the data included identifying and recording the digital payment technologies investigated in the articles, along with the key findings, to specifically address the first research question. Then, the different risks and challenges

associated with digital payment technologies were gathered to prepare data for answering the second research question.

Step 7: Data Synthesis—The data extracted were then analyzed, compared and organized into different key themes [32] that help to define the broad topic area of digital payment technologies and associated challenges. We strategized and formed a logical approach for categorizing and presenting the data we extracted [33]. We synthesized the data by categorizing and discussing each broad theme for digital payment technologies, such as card payments, e-payments, mobile payments and cryptocurrencies, and for associated challenges, such as social, economic, technical, awareness and legal challenges. The figures and tables were used to effectively communicate the findings in the next section.

Step 8: Writing the Review—The previous 7 steps sufficiently documented the review method; any future researcher should be able to reproduce the same results [27]. The review report is thoroughly discussed and conceptualized jointly by the authors, with a consensus on writing ideas and layout styles. In order to make the review write-up presentable and increase the chances of the study being widely disseminated, the authors focused on stating the findings concisely and clearly as well as making them understandable to readers [34].

4. Results and Discussion

This section presents the findings of the review.

4.1. Emerging Digital Payment Technologies

Figures 2 and 3 and Table 5 below present key themes identified for digital payment technologies. They are broadly classified into four main modes of digital payment technologies, namely, card payments, e-payments, mobile payments and cryptocurrencies. Each digital payment technology is grouped under one of these theme categories and each theme is discussed below and supported by relevant studies.

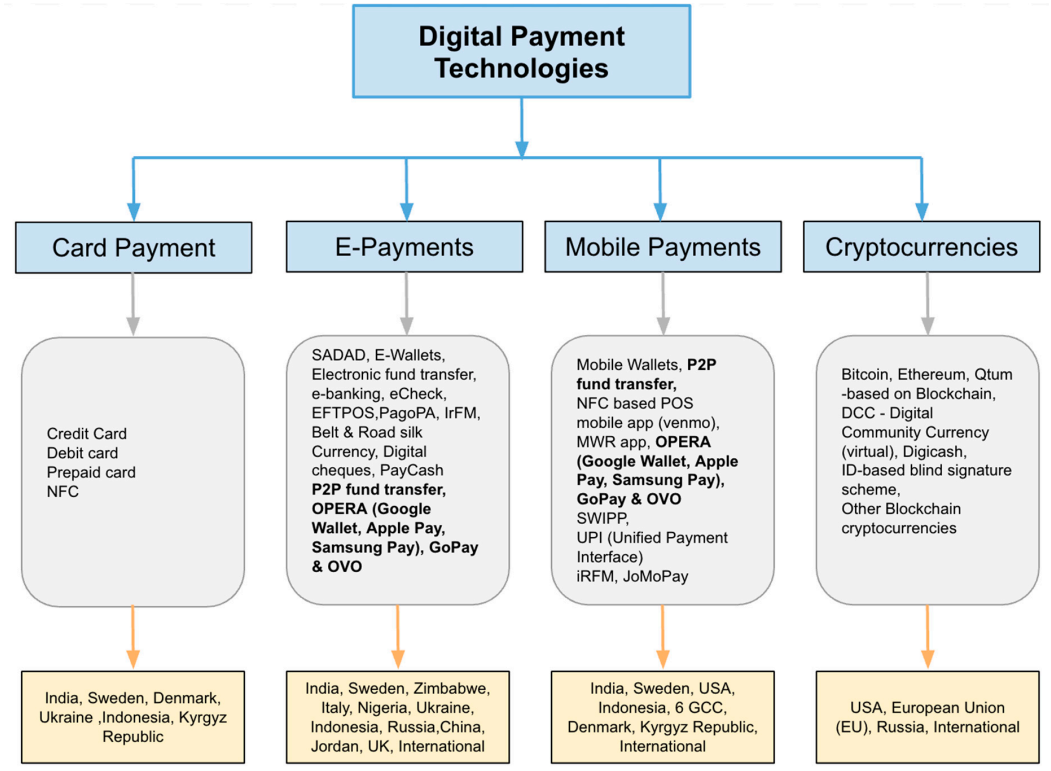

Figure 2. Emerging digital payment technologies with study location.

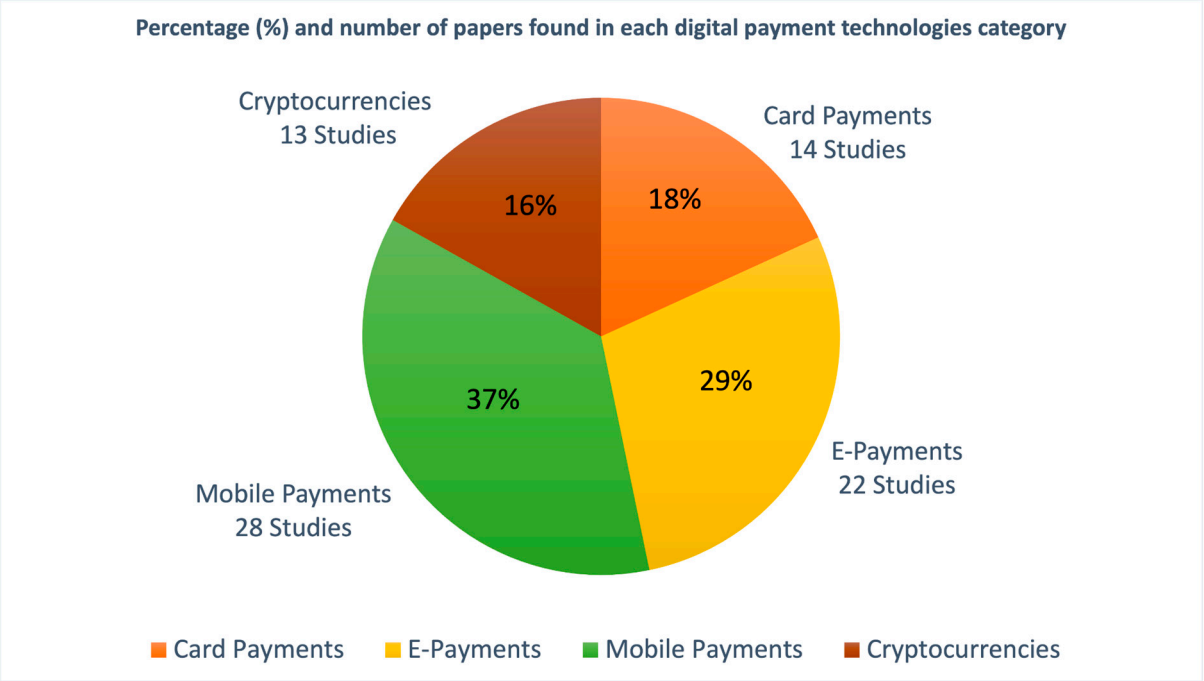

Figure 3. Percentage and number of studies conducted in each category of Digital Payment Technologies.

Table 5. Empirical studies conducted on digital payment technologies.

Digital Payment Technologies	References
Card Payments (Credit/Debit card, Prepaid card)	[11,13,35–46]
E-Payments (SADAD, E-Wallets, Electronic fund transfer, e-banking, eCheck, EFTPOS, PagoPA, IrFM, Belt & Road silk Currency, Digital cheques, P2P fund transfer, Russian PayCash, OPERA (Google Wallet, Apple Pay, Samsung Pay), GoPay & OVO)	[11,13,16,37,41,44–60]
Mobile Payments (Mobile Wallets, P2P fund transfer, NFC based POS, mobile app (venmo), MWR app, OPERA (Google Wallet, Apple Pay, Samsung Pay), GoPay & OVO, SWIPP, UPI (Unified Payment Interface) iRFM, JoMoPay)	[8,11–13,35–38,40,41,45,46,61–73]
Cryptocurrencies (Bitcoin, Ethereum, Qtum -based on Blockchain, DCC—Digital Community Currency (virtual), Digicash, ID-based blind signature scheme, Other Blockchain cryptocurrencies)	[49,54,64,74–83]

4.1.1. Card Payments

Card payments are one of the digital payment technology services made available by banks and other financial institutions to their customers. It is a more conventional form of payment compared to other categories, such as e-payments, mobile payments and cryptocurrencies. The cardholders have access to their bank accounts through the use of bank cards and make payments online or via POS machines. All card payment technologies are regarded as easy and convenient ways of making payments. However, they operate with some key differences. Debit cards allow the cardholder to pay from a deposit previously made at the bank, whereas credit cards let the cardholder spend money or withdraw cash from the ATM by taking a certain amount of money from the card service provider [84]. On the other hand, prepaid cards are a convenient way to pay for things when not carrying cash. A prepaid card is a card bought with money loaded on it, so that

we can use the card to spend up to that amount. Prepaid cards work like debit cards, but the difference is we do not need a bank account to obtain a prepaid card.

Out of 58 reviewed papers, 14 examined card payments (Table 5 and Figures 2 and 3) in India, Sweden, Denmark, India, Ukraine, Indonesia and Kyrgyz Republic. The majority of the empirical studies examined card payments in the context of India. This is mainly because several studies were conducted during the period of demonetization to empirically examine the adoption of digital payment systems to provide valuable insights to economists, policy makers and payment service providers. Demonetization triggered citizens to adopt digital payment systems [13,14,45,46,69]. Post demonetization, and particularly during the COVID-19 pandemic, there was a sudden increase in the usage of card payments in India. For instance, vendors and other small businesses, such as cafés, small restaurants and shops, auto-rickshaw drivers, etc., started using card payment technologies. The government further encouraged citizens to adopt digital forms of payments by offering financial incentives [39,45].

Dimitrova et al. [37] studied Sweden, a country known for being a role model of a cashless society. In Sweden, it is the norm for people to pay by card and other methods of digital payment services. The use of digital payment technologies, such as card payment transactions, is increasing in everyday payment processes [37]. Similarly, Pizzol et al. [42] studied new possibilities of combining card payment data as society becomes more digitalized. They studied the neighboring country, Denmark, where most purchases use credit cards. In their study, the card payment data were used to determine consumer expenditure and environmental footprints of consumption patterns [42]. Card payments also significantly impacted the economy [43]. Ravikumar et al. [43] confirmed that USD 983 billion was added to the GDP of 56 countries through card payments from 2008 to 2012, and this increased consumption by an average of 0.7%.

4.1.2. E-Payments

E-payments or electronic payments are generally known as payment technologies that do not involve physical cash, bank drafts or cheques [9] and the transactions usually take place through using internet services. It can also refer to the banking products and services that are being delivered to customers automatically via the internet [85]. In this study, e-payment and mobile payment technologies are categorized differently (see Figure 2 and Table 5). E-payment technologies refer to online payments that may or may not use mobile devices to complete transactions, whereas mobile payments use mobile phones for transactions. E-payments can be accessed either online through an e-payment website or online applications using, e.g., a laptop, tablet or desktop computer, while a mobile payment technology can be installed on a mobile device as an application and allows for "tap to pay" while shopping, often using an NFC chip. The payment through mobile payment technologies is normally made by tapping a POS machine (contactless payments) or scanning a QR code with a mobile phone. In general, mobile payment technologies can be seen as part of e-payment technologies. Some digital payment technologies (e.g., Google Wallet, Apple Pay, Samsung Pay) can be classified as both E-payments and mobile payments. However, there are some mobile payment technologies specially designed for mobile phones. For instance, the Swish app in Sweden is only available for use on mobile phones (e.g., iPhone, Android Phone). Swish is not available for use on laptops or desktops. Therefore, it is necessary to have a separate payment mode on mobile payments, which is described in Section 4.1.3.

As shown in (Table 5 and Figures 2 and 3), 22 studies out of 58 focused on e-payment technologies in countries, such as India, Sweden, Zimbabwe, Italy, Nigeria, Ukraine, Indonesia, China, Jordan and the UK. The emerging e-payment technologies found in these studies include SADAD, E-Wallets, electronic fund transfer, e-banking, eCheck, EFTPOS, PagoPA, "The Belt & Road" silk currency, OPERA (Google Wallet, Apple Pay, Samsung Pay), GoPay & OVO (Indonesia) and P2P fund transfer, etc. One of the most used e-payment technologies is the 'e-wallet', which uses electronic devices, such as computers or tablets or mobile phones,

to carry out transactions. There is a notable increase in the use of e-wallets because of their relative advantages as compared to debit and credit card payments. Although an e-wallet works the same as card payments, it has attractive cashback functions, a reward system, more convenient and better security features and, unlike debit or credit cards, e-wallets do not charge transaction fees [62]. Another similar e-payment technology is the 'digital wallet' [53], where users can transact online by linking their bank accounts. Digital wallets use electronic devices, e.g., Apple Pay is only available on Apple devices and Samsung Pay is on Android, whereas PayPal is on both Apple and Android devices. Several factors influence the adoption of digital wallets, e.g., in India, the government's vision of transforming the country into a cashless economy triggered growth [53]. Contrary to the digital wallet and e-wallet, which are both online payment systems, OPERA is an offline payment system for digital cash transactions between peer to peer [66]. OPERA addresses the limitations of other e-payment systems in terms of maintaining the key features of offline cash payments. Through the use of a 'one-time readable memory' and digital token, it enables a standard offline digital technology, which is unique to digital cash [66]. The electronic device EFTPOS stands for Electronic Funds Transfer at Point-of-Sale terminal. EFTPOS assists in initiating the transaction between a customer's personal bank account and a merchant's account. The use of EFTPOS reduces the demand for cash and lowers the overall use of currency [16]. Another interesting and emerging e-payment technology is 'The Belt & Road' silk currency, which is China's new generation e-payment system applied in 'The Belt and Road' initiative. Studies show that this e-payment technology will evolve into 'one main stem with many other branches' in the future [54]. The mechanism design of the four e-payment systems to be used in the future of "The Belt and Road" is: "The Belt and Road" 'silk currency' system based on the Euro mechanism, 'Silk Road' currency, one main stem with many other branches of e-payment systems and eSDR-based digital currency payment system for super-sovereign states [54].

4.1.3. Mobile Payments

Mobile payments refer to payments for goods and services using mobile devices, including wireless handsets, PDAs, radio frequency devices and NFC-based devices [86]. Through the usage of mobile devices, mobile banking allows customers to perform various banking activities. Mobile banking activities are conducted by using mobile internet technologies (Chong, 2013). Out of 58 studies reviewed, 28 studies (Table 5 and Figures 2 and 3) investigated emerging mobile payment technologies. These studies were conducted in various countries, such as India, Sweden, USA, Indonesia, 6 GCC (Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain, and Oman), Denmark and Kyrgyz Republic. The prominent mobile payment technologies mentioned are: Mobile Wallets, P2P fund transfer, NFC-based mobile payment, mobile app (Venmo), MWR app, OPERA (Google Wallet, Apple Pay, Samsung Pay), GoPay & OVO (Indonesia), SWIPP and UPI. For example, India is emerging as a global competitor in innovative payment systems, and various mobile payment technologies have been introduced nationwide, such as UPI (Unified Payment Interface), mobile banking and mobile wallets. Subsequently, challenges in terms of acceptance of digital payment by users belonging to different age groups were also identified [65].

Mobile payment technologies are increasingly popular for transactions as they offer relatively high security online as well as in physical shops [37]. For example, Swipp, a common bank-sector mobile payment app that was launched in the Danish market in 2013, allows for secure P2P payments. Swipp is used by customers of some of the largest banks in Denmark—Nordea, Nykredit, Jyske Bank, Sydbank, Arbejdernes landsbank and Spar Nord—and some local banks. Eighty-one banks in Denmark are in partnership with the Swipp network and it is integrated with the mobile banking app of each of the participating banks. This app makes transactions easy as a user could send money to anyone who also has Swipp, regardless of which mobile banking app they were using. Swipp is an account-based mobile payment technology that is used for transferring money through a mobile phone number [71].

Mobile payment technologies are mostly adopted by millennials. A study conducted by Singh and Mudang [69] in India shows that mobile phones are particularly popular amongst Generation Y and that they are not merely used as a music player, a navigation device or a camera device but largely for their payment services [69]. India has been the world's second-largest smartphone consumer since 2016 and has launched several mobile wallet options, such as *Paytm, Mobikwik, m-Pesa, Airtel Money*, etc. One of the latest trends in short-range wireless technology that is widely used in the payment industry is the NFC chip. The use of NFC in mobile payment technology has gained popularity mainly because it is fast, efficient and reliable. NFC-based mobile payments are made through "touch and go" apps, which are relatively easy to use [38].

4.1.4. Cryptocurrencies

Cryptocurrency is a form of digital currency secured by cryptography that makes it nearly impossible to counterfeit or double spend. Most cryptocurrencies are decentralized networks based on blockchain technology and are secured by encryption. There are 13 studies on cryptocurrencies out of 58 reviewed articles (Table 5 and Figures 2 and 3). These studies were concentrated in the US, EU, Russia and across international boundaries. The cryptocurrencies studied include Bitcoin, Digicash, DCC—Digital Community Currency (virtual)—ID-based blind signature scheme and other blockchain-based cryptocurrencies. For example, Bitcoin, as an emerging digital payment technology, is revolutionary in financial markets. It emerged as a peer-to-peer payment system combining modern cryptology and communications technology and can meet the need of decentralization, controlling of money supply, estimating the amount of money in circulation and reducing inflation. Some of the studies focused on the fluctuation in price and investment opportunities in digital cryptocurrencies represented by Bitcoin, e.g., [82], while other studies, e.g., [49], explored the characteristics of cryptocurrency and its potential vulnerabilities to money laundering (ML) and financing terrorism (FT) and recommended assessments of the risks associated with cryptocurrencies in terms of ML and FT against their functions in the financial system.

Some of the studies evaluated user privacy in Bitcoin. For example, the privacy standard of Bitcoin in a university setting was investigated [76] and the findings revealed that the privacy measures offered by Bitcoin were inadequate to safeguard user privacy. Thus, the study recommended measures to enhance the privacy protection features of Bitcoin, which ultimately helped in reducing the concerns raised over the privacy issues of Bitcoin. Similarly, other studies explored the factors influencing consumers' adoption of Bitcoin as a form of payment, e.g., a study by Almarashdeh et al. [74] showed significant factors, such as self-efficacy, transaction processing, securing and control and perceived trust for the adoption of Bitcoin. Additionally, they suggested further research on experience, age, gender and educational level [74]. The other form of cryptocurrency is virtual currency, referring to unregulated digital money created and owned by its developers and adopted by virtual community members. This type of digital money functions like any other currency in certain situations; however, it lacks some of the features of real money [78]. Thus, the DCCs are used for some transactions within a particular group of geographical locations or interest. A study by Diniz et al. [78] inspected 22 DCC platforms and identified 4 distinct groups of DCC, which contributed towards providing more knowledge to investigate a specific case of a DCC platform. It was reported that the use of DCC has been increasing because of financial crises and increased use of digital devices. For example, the Icelandic nationwide blockchain cryptocurrency "Auroracoin" was developed in response to the 2008 financial crisis [87]. Studies have also shown that even though DCC helps in social and financial inclusion, digital payment studies have not considered an in-depth study on DCC [78].

4.2. Challenges

Digital payment systems, despite their numerous benefits, come with their own challenges. These challenges vary from country to country, depending on the socio-economic

factors as well as technical, legal (regulations) and awareness level of citizens. For instance, in some developing countries, the digital payment systems successfully drive financial inclusion (e.g., M-Pesa in Kenya). However, in some developed countries (e.g., in Scandinavian countries, especially Sweden), where the use of cash is rapidly declining and the country is becoming cashless, there is a challenge in terms of digital divide, as businesses decide not to accept cash. Businesses prefer digital payments because handling cash is expensive for them as it incurs expenses in obtaining cash from banks, reconciling the cash at the end of each day, storing cash and transferring the cash back to their bank accounts. Thus, in this section, we address research question 2: *What are the challenges associated with the digital payment technologies?* The challenges are classified into five main themes (Figure 4 and Table 6), namely *social, economic, technical, awareness and legal.*

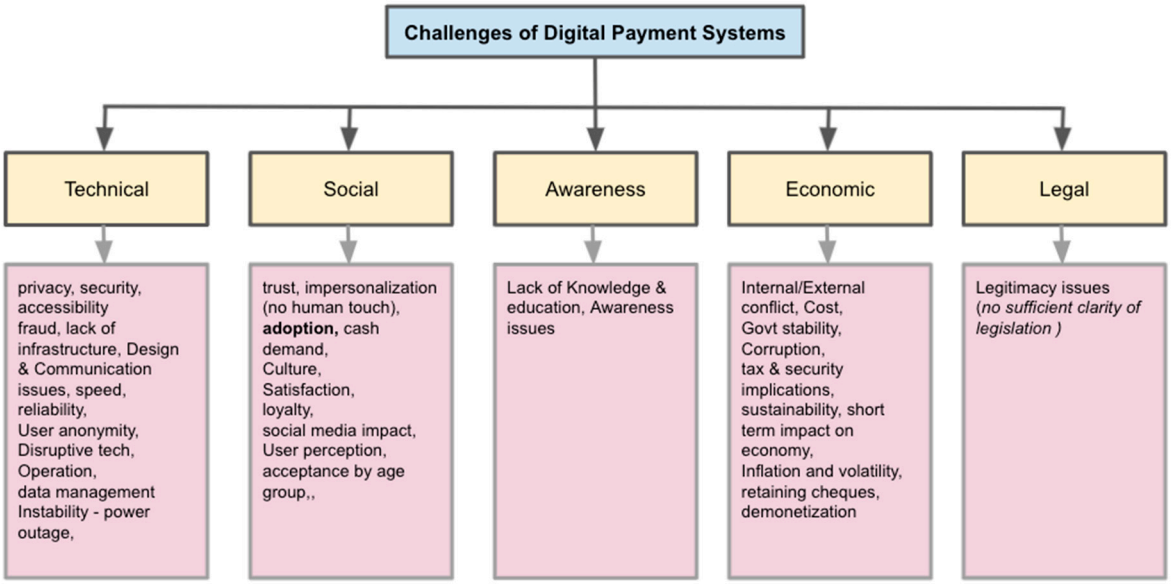

Figure 4. Classification of digital payment technology challenges.

Table 6. Challenges of digital payment technologies and reviewed studies.

Challenges	Studies Conducted
Social challenges—trust, impersonalization (no human touch), adoption, risks, cash demand, Culture, satisfaction, loyalty, social media impact, user perception, acceptance by age group,	[11,13,14,16,37,39,41,47,48,52,56,57,60,62,65,67, 69,70,73,75,79,80]
Economic challenges—Internal/External conflict, Cost, Govt stability, Corruption, tax, cost implications & sustainability, short term impact on economy, inflation, volatility, retaining cheques, demonetization,	[8,13,35,36,43,56,59,61,62,68,82]
Technical challenges—privacy, security, access, fraud, lack of infrastructure, Design & Communication issues, speed, reliability, User anonymity, HR, Disruptive tech, operation, data management, Instability—power outage,	[8,11–13,37,38,40,41,44–47,50–52,56–59,63,66,69,71,72,76,79,81–83,88–90]
Awareness challenges (Lack of Knowledge & Awareness)	[11–13,42,44,45,51,53,55,57]
Legal challenges (Legitimacy problem—*no sufficient clarity of legislation*)	[49,52,64,74,76–79,82]

4.2.1. Social Challenges

Social challenges of digital payment technologies are associated with social influence, which is connected to a person's feelings that their friends and acquaintances think that they must use certain technologies. The behavior of individuals is influenced by their social circle, as this may preserve interrelationships and social harmony [91]. Out of 58 studies, 20 studies mentioned social challenges associated with digital payment technologies, such as trust, impersonalization (no human touch), risks, adoption, demands, culture, satisfaction, loyalty, social media impact, user perception and acceptance by age group (see Table 6). For example, Vines et al. [59] investigated the joy of cheques in the UK. Their qualitative study that explored the banking experiences of 23 people over eighty years old found that the case for retaining and enhancing physical cheques is stronger. Thus, there was a challenge of "acceptance by age group" and rather than replacing cheques with e-cheques, designing ways of making them less costly to process was the only option [59].

The challenges of "trust" for the emerging digital payment technologies were highlighted by several studies. Trust refers to the accumulation of customer beliefs of integrity, benevolence and ability that could increase customer willingness to use the technology easily. Rana et al. [12] investigated "trust" as one of the main barriers to emerging digital payment technologies. They found that security concerns related to e-banking and mobile banking, i.e., monetary loss due to transaction error or bank account misuse, led to a "lack of trust". People see more risks in mobile devices, as they can be misplaced or stolen and may result in the exposure of confidential information [12]. Similarly, it was also confirmed that overcoming the issue of lack of trust is the most challenging task for the digital wallet service provider. A study by Bagla and Sancheti [62] investigated customer satisfaction with digital wallets and found that high risk and uncertainty are involved in digital payment systems. The study further highlighted that in e-transactions, trust is affected by design aesthetics, usefulness, ease of use and customization [62]. Thus, as pointed out by Dimitrova et al. [37], despite being increasingly popular and ubiquitous for transactions and having relatively high security, consumers still perceive digital payments as risky, unsecure and untrustworthy [37].

4.2.2. Technical Challenges

Compared to other challenges, more studies have covered technical challenges associated with emerging digital payment technologies. Thus, 32 studies out of 58 (see Table 6) included technical issues, such as privacy, security, access, fraud, lack of infrastructure, design and communication issues, speed, reliability, user anonymity, disruptive technology, operation, data management and instability (power outage). Overall, the technical challenges relate to *'safety and reliability issues'* and *'privacy issues'*. The studies highlighted security breaches and lack of protection against fraud and cyberattacks as reasons for reducing consumers' use of digital payment technologies. Similarly, in terms of 'privacy', the interception of confidential information, incomplete and interrupted transactions and frequent service denial faced by consumers lowered their trust and engagement towards digital payment technologies. It was indicated that the scope and magnitude of privacy risk had substantial effects on consumers' confidence and negatively impacted the global economy in general. Furthermore, it was found that although there are other negative impacts imposed by the privacy risks, the significant effect is the loss of customer trust [8]. Digital payment technologies have their own share of technical glitches. The payments do not always run smoothly. For example, UPI-based payment technology in India called BHIM (Bharath Interface for Money) reported having problems when installing and operating [14]. This shows that although consumers are ready to use digital payment technologies, there are challenges regarding infrastructure and availability. Furthermore, network failures negatively impacted system popularity [14]. Similarly, Kaleeth and Chellammal [13] emphasized improving infrastructure facilities in the rural areas of India where poor network connectivity disrupts a transaction to result in incomplete transactions.

Studies have also spotlighted issues related to cryptocurrencies, e.g., it was found that the existing privacy measures of Bitcoin are not sufficient to safeguard user privacy. Studies confirmed that Bitcoin users' privacy is compromised, even when the users are in strict compliance with the Bitcoin security requirements [76]. Subsequently, it was discovered that in the process of the fast-paced development of Bitcoin, it has been frequently exposed to various security threats where numerous accidents occur, such as Bitcoin trading platforms being stolen by hackers. This has made the future development of Bitcoin unforeseeable [82].

4.2.3. Economic Challenges

Out of 58 studies reviewed, 11 empirical studies concentrated on the economic challenges associated with the technologies used in digital payments. Economic, in this review context, means the management of financial matters for a community, business or family and the digital payment technology challenges include internal and external conflict, cost, government stability, corruption, tax and security implications, sustainability, inflation, or volatility, retaining cheques and demonetization (see Table 6). For instance, internal and external conflict poses a great economic imbalance, e.g., if there is political violence in a country, which negatively impacts governance. Similarly, external conflicts can be related to a risk faced by the incumbent government from foreign action, ranging from non-violent external pressure to violent external pressure [8]. Thus, the government or the digital payment regulators need to enhance their countries' data privacy and protection practices to reduce risks of data misuse. They should be able to gain the trust of both their citizens and other international communities for the digital payment technologies to function at optimum, which, in turn, contributes to the overall economy [8].

Other issues related to digital payment technologies include the cost of using the technology. The digital payment apps should be affordable for users to use the system. For example, studies have shown that the use of a digital wallet is costing more than other forms of payment, e.g., cash payment, which posed challenges to consumers' sustainability [62]. Consumers prefer cash because, compared to digital wallets, it does not involve any significant cost. Therefore, to meet consumers' demand and to have a competitive edge over cash payment, digital wallets must be safe and secure at a very nominal cost or else a user may switch to cash at any time [62]. Apart from cost, there is also a challenge of digital payment technologies being transparent and traceable. For example, in India, small retail merchants are reluctant to use digital payment technologies because of potential tax implications. They choose cash payment over digital means as they do not want to record their transactions in the system to evade taxes later [14]. As a first full-fledged decentralized digital payment technology, the emergence of Bitcoin is considered revolutionary in financial markets. Nonetheless, Bitcoin is still examined as a speculative tool as it makes it difficult to resist inflation because of its highly volatile nature in terms of price [82].

4.2.4. Awareness Challenges

The lack of knowledge and awareness was highlighted as a challenge in digital payment technologies in 10 studies. For example, in order to curb the black money business, India encouraged electronic payments and enabled the nation to move towards a cashless society. The shift in the payment system from cash-based transactions to digital was part of the Digital India campaign, launched for the welfare of the public. Therefore, the move was anticipated to be fast and smooth [57]. However, studies showed that people pay through cash more than they do electronically. Although trust was one of the reasons behind skepticisms, comparatively, it was found that educated people are using more cashless transactions, e.g., out of 100 digital payment technology users, 79 are in the educated group (12th standard to graduate-level degree) [57]. This shows that the lack of knowledge and awareness about digital payment technologies affects people's willingness to shift from cash to digital payments [57]. Furthermore, it was highlighted that the 'lack of literacy or digital literacy' is one of the key challenges of using digital financial services [12]. Additionally, other studies emphasized that the lack of digital literacy, language barrier and

awareness of digital payments discouraged people from using digital payment systems [13]. Thus, it was suggested to establish digital literacy kiosks or help desks in rural areas [13].

Another big challenge was the 'inability to reach a critical mass of consumers' and the issues concerning financial inclusion. Shah and Dubhashi [92] highlighted that mostly low income, unemployed, disabled and illiterate people and women are excluded from formal financial services due to emerging digital payment technologies. Therefore, the study advised that an integrated approach should be adopted for achieving trust on the usage of digital payment technologies. It was further stated that people should be educated with information relevant to the application of digital payment systems and their security concerns. Further, policymakers and regulatory bodies must make clear guidelines in an easily understandable format for the usage of digital payment technologies and attached benefits [92].

4.2.5. Legal Challenges

Out of 58 studies, 9 scrutinized legitimacy challenges of digital payment technologies. There are challenges in legitimacy concerns, mostly cryptocurrencies, such as Bitcoin, that run on blockchain technology. Several governments all over the world view future development of cryptocurrencies, such as Bitcoin, as likely to be limited [82]. Studies provide suggestions for investors to consider the price trend, security risks and legal policies concerning Bitcoin when investing [82]. It was further confirmed that Bitcoin investment can be improved by legislation and the value of Bitcoin can be recognized and can become a legal investment only if it is supported by legislation.

Likewise, studies have also explored the phenomenon of cryptocurrencies, such as Bitcoin and Digicash, to examine their potential vulnerabilities [49]. They focused particularly on the in-depth analysis of what challenges these cryptocurrencies may pose to the global anti-money-laundering and financing of terrorism. Their research shows that anonymity is the most criticized characteristic of cryptocurrencies, which is likely to make it unpopular among consumers. Despite 'anonymity' being an important feature for privacy, it brings numerous risks to the customer, for instance, if the user is unable to keep the right of property in case of loss or theft. The study highlights the challenges of understanding the nature of cryptocurrencies to assess the potential risks of digital payment systems being abused by criminals [49].

4.3. Remarks on the Identified Challenges

While the future of mobile payment technologies may be bright, many challenges must still be overcome. The challenges of digital payment technologies found in this review are categorized under five key themes (see Figure 5). The majority of the studies (39%) covered the technical challenges in digital payment technologies (32 studies). As pointed out by Sharif and Pal [44], this is mainly because there has been a significant change in the means of making and receiving payments and that the number of modes of payments has been increased substantially due to technological infrastructure and policy changes.

The technical challenges in *privacy, security and lack of technical infrastructure* were cited the most in some studies (e.g., [8,37,44,55,72]). It was evident that consumers face security problems and poor network connectivity issues while making cashless transactions [44]. Similarly, their lack of awareness in existing security controls causes vulnerabilities in payment technologies, which severely compromise the users' privacy and users' data communications [72]. Thus, it is crucial to incorporate smart security features technically into the payment systems, so that the users can use digital payment technologies without the fear of security and privacy threats. Furthermore, it was confirmed that privacy and security factors influence payment technologies amongst micro, small and medium enterprises [55]. Additionally, an assessment of country-level privacy risk for digital payment systems highlighted the privacy risks from cyberattacks and the threat of data misuse from the analysis of mobile wallets and remittance privacy policies [8].

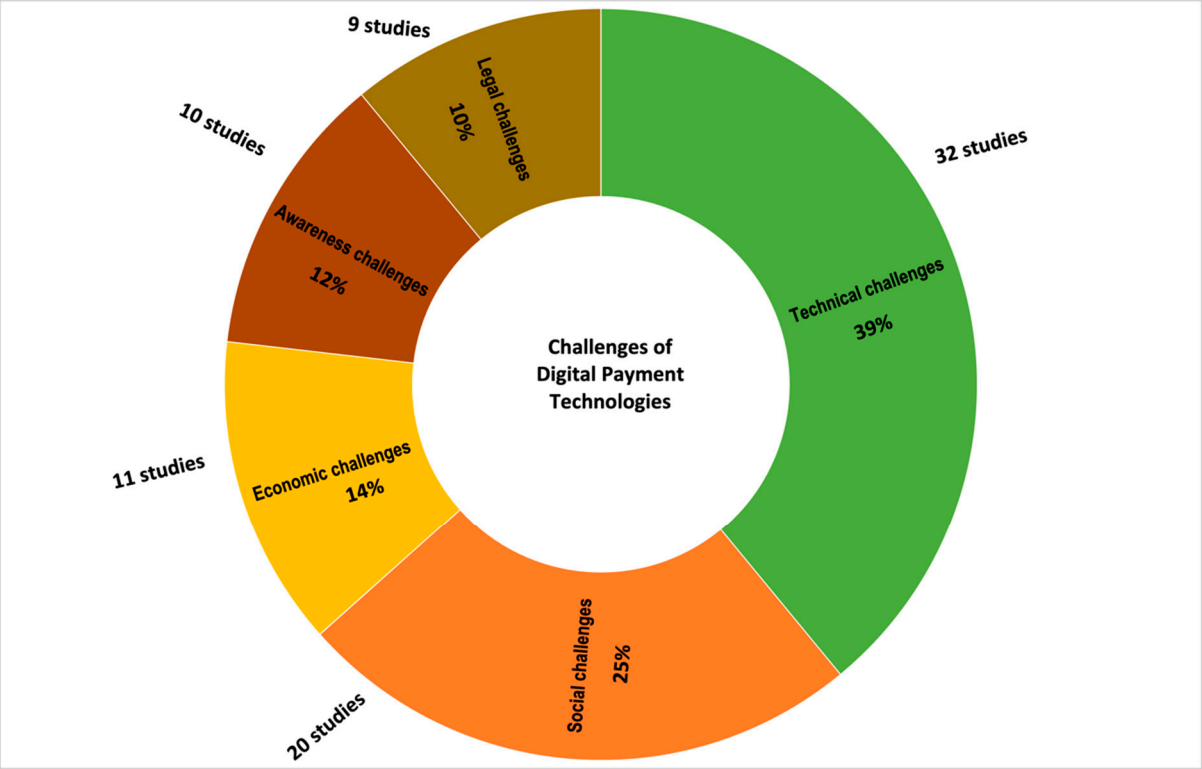

Figure 5. Categorization of digital payment technology challenges.

The social challenges were mentioned in 20 studies, which constituted 25% of the articles reviewed. Although the social challenges of digital payment technologies cover various social aspects, most studies discussed 'trust' as the core challenge associated with payment technologies. It is important to note that digital payments are not simply about technology. The social aspects play a vital role for consumers. Many studies (e.g., [11,14,69]) highlighted the 'trust issues' in digital payment technology adoption, which involves consideration, such as how consumers react to payment technologies and how comfortable they feel with transacting digitally. Most findings suggested that the intention to use digital payments was determined by the perceived ease of usage, perceived usefulness, attitude towards digital payment and, particularly, by trust [11]. For example, millennials' choice of payment technologies depends on how much they trust the ability of digital payment technologies to protect their privacy. Thus, their faith depends on the reputation of the payment technology [69]. Similarly, a lack of trust in regulation is one of the main challenges faced by small retail stores in the context of adopting digital payment technologies [14].

From the consumer perspective, the economic challenges caused by digital payment technologies are mostly concerned with the cost of using the technology itself [62,82]. Compared to handling cash, which does not cost anything for consumers, digital payment technologies, such as digital wallets from banks, incurred monthly fees for simply using the payment technology. Another economic issue that comes to the fore is the problem of inflation rate caused by the high volatility of cryptocurrencies resulting in speculative markets.

The awareness challenges highlighted a lack of digital literacy and awareness about digital payments that discouraged people from using digital payment technologies [13,57] Similarly, legal challenges concern the legitimacy of cryptocurrencies, such as Bitcoin, which completely decentralized the digital payment system and revolutionized financial markets.

5. Limitations

While this study builds a knowledge base on digital payment technologies and challenges, there are some limitations. Firstly, the articles used in this study were searched from the 'Web of Science' and Scopus. Although these two databases complement each

other and contain all the peer-reviewed journal articles and conference papers required for the review, there may be a limited number of other studies available for review from other databases. Therefore, future reviews could consider searching a wider range of databases. Secondly, this review is purely based on empirical studies as the source of data; however, the sample size in some of the studies is comparatively small to generalize the findings, and most of the studies were conducted based on a single-group sample where data were gathered through questionnaires and online surveys (21 studies used questionnaires and surveys, e.g., [13,39,45,57]). Thus, future systematic reviews could focus more on studies conducted with other methods where data are collected through case studies, interviews, experiments, observations, etc.

Another limitation of this study is that, to ensure the quality of the review, only peer-reviewed articles were used and other conceptual papers, such as white papers, book chapters, organizational reports and literature reviews, which relied on secondary data sources, were left out. Including such publications would have added more insights to this review. Future research could draw more knowledge and add value into the review by considering such documents.

6. Conclusions

Using the eight-step systematic literature review method of Okoli and Schabram to validate the quality of the literature, 58 final articles were reviewed for this study. From the review results, the digital payment technologies were classified into four modes of payment methods: *card payments, e-payments, mobile payments and cryptocurrencies.* This classification of the emerging digital payment technologies provides a state-of-the-art overview of the widely dispersed knowledge of digital payment systems. Thus, the study provides insights into the latest trends in digital payment technologies and improves education about digital finance. The classification can also help future researchers obtain quality references for research in the field of cashless payment systems.

From the review findings, the challenges with digital payment technologies were categorized into five key themes: *social, economic, technical, awareness and legal challenges*. It was found that the majority of the studies (39%) covered technical challenges. The technical issues of *privacy, security and 'lack of technical infrastructure'* were the main challenges associated with the emerging digital payment technologies. In terms of social challenges, 'trust' was found to be the core challenge for the emerging payment technologies. The cost and inflation rate caused by volatility of cryptocurrencies were highlighted as economic challenges, whereas the legitimacy concerning cryptocurrencies was considered as the primary cause of concern under legal challenges and 'digital literacy'. Awareness about digital payment technologies was found to be the most critical awareness challenge.

The categorization of digital payment technology challenges into key themes and highlighting key findings under each challenge theme will help practitioners, such as bank directors and policy makers, to advance their understanding of digital payment technological challenges in various cultural settings and dynamics. It will also enable them to enhance their knowledge about the constantly evolving digital payment technology issues.

To the best of our knowledge, this is the first comprehensive review study, which collected and classified the emerging digital payment technologies and associated challenges that provide theoretical and practical directions. This study offers some insight for future researchers in the field of digital payments, by (1) complementing previous literature review studies on digital payment technologies, (2) highlighting challenges associated with digital payment technologies and (3) providing a ground for building a sound digital payment ecosystem to overcome the challenges with digital payment technologies.

Author Contributions: Conceptualization, K.K., M.S.I. and S.G.; methodology, K.K.; writing—original draft preparation, K.K., M.S.I. and S.G.; writing—review and editing, K.K., M.S.I. and S.G.; supervision, M.S.I. and S.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Not Applicable, the study does not report any data.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Slozko, O.; Pelo, A. Problems and Risks of Digital Technologies Introduction into E-Payments. *Transform. Bus. Econ.* **2015**, *14*, 42–59.
2. Premchand, A.; Choudhry, A. Future of Payments—ePayments. *Int. J. Emerg. Technol. Adv. Eng.* **2015**, *5*, 110–115.
3. Capgemini. 2020 World Payments Report: Transforming into Digital Masters in the Next Normal; World Payments Report: 2020. Available online: https://www.sogeti.com/explore/reports/world-payments-report-2020/ (accessed on 8 November 2022).
4. Statista. 2021 Digital Payments Report. Statista Digital Market Outlook. 2021. Available online: https://www.statista.com/study/41122/fintech-report-digital-payments/ (accessed on 8 November 2022).
5. Khando, K.; Islam, M.S.; Gao, S. Factors Shaping the Cashless Payment Ecosystem: Understanding the Role of Participating Actors. In Proceedings of the 35th Bled eConference-Digital Restructuring and Human (Re) Action, Bled, Slovenia, 26–29 June 2022; University of Maribor University Press: Maribor, Slovenia, 2022; pp. 161–186.
6. Visa School of Public Policy. (2 May 2018). Digital Payments & Economic Growth [Video]. YouTube. Available online: https://www.youtube.com/watch?v=EnzGI1yGcu0 (accessed on 8 November 2022).
7. Goodell, G.; Al-Nakib, H.D.; Tasca, P. A digital currency architecture for privacy and owner-custodianship. *Future Internet* **2021**, *13*, 130. [CrossRef]
8. Akanfe, O.; Valecha, R.; Rao, H.R. Assessing country-level privacy risk for digital payment systems. *Comput. Secur.* **2020**, *99*, 102065. [CrossRef]
9. Singh, T.V.; Supriya, N.; Joshna, M.S. Issues and challenges of electronic payment systems. *Int. J. Innov. Res. Dev.* **2016**, *2*, 25–30.
10. Khairun, N.K.; Yasmin, M.H. E-commerce Adoption in Malaysia: Trends, Issues and Opportunities. In *ICT Strategic Review*; PIKOM Publishers: Petaling Jaya, Malaysia, 2010; pp. 89–134.
11. Najib, M.; Fahma, F. Investigating the adoption of digital payment system through an extended technology acceptance model: An insight from the Indonesian small and medium enterprises. *Int. J. Adv. Sci. Eng. Inf. Technol.* **2020**, *10*, 1702–1708. [CrossRef]
12. Rana, N.P.; Luthra, S.; Rao, H.R. Developing a Framework using Interpretive Structural Modeling for the Challenges of Digital Financial Services in India. In Proceedings of the 22nd Pacific Asia Conference on Information Systems (PACIS 2018), Yokohama, Japan, 26–30 June 2018; Association for Information Systems: Atlanta, Georgia, 2018; p. 53. Available online: https://core.ac.uk/download/pdf/301375969.pdf (accessed on 8 November 2022).
13. Kaleeth, A.B.L.; Chellammal, T. Adoption of Digital Payment Methods in Rural Areas of Ramanathapuram District. *Ann. Rom. Soc. Cell Biol.* **2021**, *25*, 7831–7837.
14. Seethamraju, R.; Diatha, K.S. *Adoption of Digital Payments by Small Retail Stores*; UTS ePress: Ultimo, Australia, 2018.
15. Ramli, F.A.A.; Hamzah, M.I. Mobile payment and e-wallet adoption in emerging economies: A systematic literature review. *J. Emerg. Econ. Islam. Res.* **2021**, *9*, 1–39. [CrossRef]
16. Arango-Arango, C.A.; Suárez-Ariza, N. Digital payments adoption and the demand for cash: New international evidence. *J. Paym. Strategy Syst.* **2020**, *14*, 392–410.
17. Casino, F.; Dasaklis, T.K.; Patsakis, C. A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telemat. Inform.* **2019**, *36*, 55–81. [CrossRef]
18. Dahlberg, T.; Mallat, N.; Ondrus, J.; Zmijewska, A. Past, present and future of mobile payments research: A literature review. *Electron. Commer. Res. Appl.* **2008**, *7*, 165–181. [CrossRef]
19. Kabir, M.A.; Saidin, S.Z.; Ahmi, A. Adoption of e-payment systems: A review of literature. In Proceedings of the International Conference on E-Commerce, Kuching, Malaysia, 20–22 October 2015; pp. 112–120.
20. Adeoti, O.; Osotimehin, K. Adoption of point of sale terminals in Nigeria: Assessment of consumers' level of satisfaction. *Res. J. Financ. Account.* **2012**, *3*, 1–6.
21. DeVries, P.D. An analysis of cryptocurrency, bitcoin, and the future. *Int. J. Bus. Manag. Commer.* **2016**, *1*, 1–9.
22. Insider Intelligence. Digital Payment Industry in 2021: Payment Methods, Trends, and Tech Processing Payments Electronically. 2021. Available online: https://www.insiderintelligence.com/insights/digital-payment-services/ (accessed on 8 November 2022).
23. Rotolo, D.; Hicks, D.; Martin, B.R. What is an emerging technology? *Res. Policy* **2015**, *44*, 1827–1843. [CrossRef]
24. Diniz, E.; Porto de Albuquerque, J.; Cernev, A. Mobile Money and Payment: A literature review based on academic and practitioner-oriented publications (2001–2011). Oriented Publications (2001–2011) (3 December 2011). In Proceedings of the SIG GlobDev Fourth Annual Workshop, Shanghai, China, 3 December 2011.
25. Karsen, M.; Chandra, Y.U.; Juwitasary, H. Technological factors of mobile payment: A systematic literature review. *Procedia Comput. Sci.* **2019**, *157*, 489–498. [CrossRef]
26. Patil, P.P.; Dwivedi, Y.K.; Rana, N.P. Digital payments adoption: An analysis of literature. In *Conference on e-Business, e-Services and e-Society*; Springer: Cham, Switzerland, 2017; pp. 61–70.
27. Chitu, O.; Schabram, K. *A Guide to Conducting a Systematic Literature Review of Information Systems Research*; SSRN: Amsterdam, The Netherlands, 2010.
28. Falagas, M.E.; Pitsouni, E.I.; Malietzis, G.A.; Pappas, G. Comparison of PubMed, Scopus, web of science, and Google scholar: Strengths and weaknesses. *FASEB J.* **2008**, *22*, 338–342. [CrossRef]

29. Fink, A. *Conducting Research Literature Reviews: From the Internet to Paper*; Sage Publications: Thousand Oaks, CA, USA, 2019.
30. Hart, C. *Doing a Literature Review: Releasing the Social Science Research Imagination*, 1st ed.; Sage Publications Ltd.: Thousand Oaks, CA, USA, 1999.
31. *Kitchenham Guidelines for Performing Systematic Literature Reviews in Software Engineering*; Technical report, Ver. 2.3 EBSE Technical Report; EBSE: Goyang-si, Republic of Korea, 2007; Volume 5.
32. Levy, Y.; Ellis, T.J. A systems approach to conduct an effective literature review in support of information systems research. *Inf. Sci.* **2006**, *9*, 181–212. [CrossRef]
33. Webster, J.; Watson, R.T. Analyzing the past to prepare for the future: Writing a literature review. *MIS Q.* **2002**, *26*, xiii–xxiii.
34. Boote, D.N.; Beile, P. Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educ. Res.* **2005**, *34*, 3–15. [CrossRef]
35. Balan, U.M.; Pal, A. Is Cash Still the Enemy? The Dampening of Demonetization's Ripple Effect on Mobile Payments. In *International Working Conference on Transfer and Diffusion of IT*; Springer: Cham, Switzerland, 2020; pp. 529–540.
36. Chakrabarty, M.; Jha, A.; Ray, P. Demonetization and digital payments in India: Perception and reality. *Appl. Econ. Lett.* **2021**, *28*, 319–323. [CrossRef]
37. Dimitrova, I.; Öhman, P.; Yazdanfar, D. Challenges in the Limited Choice of Payment Methods in Terms of Cashless Society: Bank Customers' Perspective (work in progress). In Proceedings of the 2019 3rd International Conference on E-Commerce, E-Business and E-Government, Lyon, France, 18–21 June 2019; pp. 45–48.
38. Iqbal, R.; Ahmad, S.; Hashim, M. Evaluating Factors Affecting Communication in Wearable Internet of Things for Near Field. In Proceedings of the 2018 IEEE 87th Vehicular Technology Conference (VTC Spring), Porto, Portugal, 3–6 June 2018; pp. 1–4.
39. Jain, K.; Chowdhary, R. A Study on Intention to Adopt Digital Payment Systems in India: Impact of COVID-19 Pandemic. *Asia Pac. J. Inf. Syst.* **2021**, *31*, 76–101. [CrossRef]
40. Kantoroeva, A.K.; Toktomamatova, N.K. Some Aspects of the Development of Payment Innovations in the Kyrgyz Republic. *Int. J. Criminol. Sociol.* **2020**, *9*, 3007–3013.
41. Ligon, E.; Malick, B.; Sheth, K.; Trachtman, C. What explains low adoption of digital payment technologies? Evidence from small-scale merchants in Jaipur, India. *PLoS ONE* **2019**, *14*, e0219450. [CrossRef] [PubMed]
42. Pizzol, M.; Vighi, E.; Sacchi, R. Challenges in coupling digital payments data and input-output data to change consumption patterns. *Procedia CIRP* **2018**, *69*, 633–637. [CrossRef]
43. Ravikumar, T.; Suresha, B.; Sriram, M.; Rajesh, R. Impact of Digital Payments on Economic Growth: Evidence from India. *Int. J. Innov. Technol. Explor. Eng.* **2019**, *8*, 553–557.
44. Sharif, M.; Pal, R. Moving from cash to cashless: A study of consumer perception towards digital transactions. *PRAGATI J. Indian Econ.* **2020**, *7*, 1–13.
45. Sivathanu, B. Adoption of digital payment systems in the era of demonetization in India: An empirical study. *J. Sci. Technol. Policy Manag.* **2019**, *10*, 143–171. [CrossRef]
46. Thirupathi, M.; Vinayagamoorthi, G.; Mathiraj, S.P. Effect Of Cashless Payment Methods: A Case Study Perspective Analysis. *Int. J. Sci. Technol. Res.* **2019**, *8*, 394–397.
47. Al-Okaily, M.; Lutfi, A.; Alsaad, A.; Taamneh, A.; Alsyouf, A. The determinants of digital payment systems' acceptance under cultural orientation differences: The case of uncertainty avoidance. *Technol. Soc.* **2020**, *63*, 101367. [CrossRef]
48. Datta, P.; Walker, L.; Amarilli, F. Digital transformation: Learning from Italy's public administration. *J. Inf. Technol. Teach. Cases* **2020**, *10*, 54–71. [CrossRef]
49. Dostov, V.; Shust, P. Cryptocurrencies: An unconventional challenge to the AML/CFT regulators? *J. Financ. Crime* **2014**, *21*, 249–263. [CrossRef]
50. Huang, P.; Boucouvalas, A.C. Future personal" e-payment": IRFM. *IEEE Wirel. Commun.* **2006**, *13*, 60–66. [CrossRef]
51. Ilankumaran, G.; Darling Selvi, V. Customer Purview of Cashless Payment System in the Digital Economy of India. *Int. J. Innov. Technol. Explor. Eng.* **2019**, *8*, 87–93.
52. Ivashchenko, A.; Britchenko, I.; Dyba, M.; Polishchuk, Y.; Sybirianska, Y.; Vasylyshen, Y. Fintech platforms in SME's financing: EU experience and ways of their application in Ukraine. *Investig. Manag. Financ. Innov.* **2018**, *15*, 83–96. [CrossRef]
53. Kumar, M.; Agrawal, S.; Mishra, R. User Behaviour and Digital Payment Ecosystem: An Audit of Connections between usage Attributes and Demographic Profile. *Int. J. Emerg. Technol.* **2020**, *11*, 935–938.
54. Liu, F.; Lu, S.; Qin, S.; Shao, S. Research on the New Generation Electronic Payment System Applied in 'The Belt and Road'. In Proceedings of the 2020 International Conference on E-Commerce and Internet Technology (ECIT), Zhangjiajie, China, 22–24 April 2020; pp. 5–9.
55. Lakshmi, M.S.; Alamelumangai, R. Cashless Transactions: Opportunities and Challenges amongst MSME at Sivaganga District, Tamilnadu. *Int. J. Sci. Technol. Res.* **2020**, *9*, 4900–4902.
56. Nwankwo, O.; Eze, O.R. Electronic payment in cashless economy of Nigeria: Problems and prospect. *J. Manag. Res.* **2013**, *5*, 138–151. [CrossRef]
57. Selvakumar, D.S.; Sharma, A.K. A Study on Market Without Cash—Conventional to Digital. *Int. J. Appl. Bus. Econ. Res.* **2017**, *15*, 337–342.
58. Simatele, M.; Mbedzi, E. Consumer payment choices, costs, and risks: Evidence from Zimbabwe. *Cogent Econ. Financ.* **2021**, *9*, 1875564. [CrossRef]

59. Vines, J.; Dunphy, P.; Blythe, M.; Lindsay, S.; Monk, A.; Olivier, P. The joy of cheques: Trust, paper and eighty somethings. In Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work, Seattle, WA, USA, 11–15 February 2012; pp. 147–156.
60. Vinitha, K.; Vasantha, S. Determinants of Customer intention to use Digital payment system. *J. Adv. Res. Dyn. Control Syst.* **2020**, *12*, 168–174.
61. Alshubiri, F. The Impact of Financial Macroeconomic Indicators on Mobile Money: An Empirical Evidence of GCC Countries. In Proceedings of the 2019 International Conference on Digitization (ICD), Sharjah, United Arab Emirates, 18–19 November 2019; pp. 118–122.
62. Bagla, R.K.; Sancheti, V. Gaps in customer satisfaction with digital wallets: Challenge for sustainability. *J. Manag. Dev.* **2018**, *37*, 442–451. [CrossRef]
63. Chen, C.L.; Lin, Y.C.; Chen, W.H.; Chao, C.F.; Pandia, H. Role of Government to Enhance Digital Transformation in Small Service Business. *Sustainability* **2021**, *13*, 1028. [CrossRef]
64. Garcia-Teruel, R.M. Legal challenges and opportunities of blockchain technology in the real estate sector. *J. Prop. Plan. Environ. Law* **2020**, *12*, 129–145. [CrossRef]
65. Gupta, R.; Kapoor, C.; Yadav, J. Acceptance Towards Digital Payments and Improvements in Cashless Payment Ecosystem. In Proceedings of the 2020 International Conference for Emerging Technology (INCET), Belgaum, India, 5–7 June 2020; pp. 1–9.
66. Park, K.W.; Baek, S.H. OPERA: A Complete Offline and Anonymous Digital Cash Transaction System with a One-Time Readable Memory. *IEICE Trans. Inf. Syst.* **2017**, *100*, 2348–2356. [CrossRef]
67. Pradiatiningtyas, D.; Dewa, C.B.; Safitri, L.A.; Kiswati, S. The Effect of Satisfaction and Loyalty Towards Digital Payment System Users Among Generation Z in Yogyakarta Special Region. In *Journal of Physics: Conference Series*; IOP Publishing: Bristol, UK, 2022; Volume 1641, p. 012110.
68. Sandeep, K.; Nidhi, W. Impact of Demonetization on Digital Payments in India—Event Study Methodology. *Pac. Bus. Rev. Int.* **2020**, *13*. Available online: http://www.pbr.co.in/2020/2020_month/October/2.pdf (accessed on 8 November 2022).
69. Singh, A.K.; Mudang, T. Digital Payment System and the Millennial in a Smart City: An Antecedent to Technopreneurship. In *Electronic Systems and Intelligent Computing*; Springer: Singapore, 2020; pp. 109–118.
70. Singh, G.; Kumar, B.; Gupta, R. The role of consumer's innovativeness & perceived ease of use to engender adoption of digital wallets in India. In Proceedings of the 2018 International Conference on Automation and Computational Engineering (ICACE), Greater Noida, India, 3–4 October 2018; pp. 150–158.
71. Staykova, K.S.; Damsgaard, J. The race to dominate the mobile payments platform: Entry and expansion strategies. *Electron. Commer. Res. Appl.* **2015**, *14*, 319–330. [CrossRef]
72. Thiruvaazhi Arthi, R. Threats to Mobile Security and Privacy. *Int. J. Recent Technol. Eng.* **2018**, *7*, 407–412.
73. Zhang, X.; Tang, S.; Zhao, Y.; Wang, G.; Zheng, H.; Zhao, B. Cold hard E-cash: Friends and vendors in the Venmo digital payments system. In Proceedings of the International AAAI Conference on Web and Social Media, Montreal, QC, Canada, 15–18 May 2017; Volume 11.
74. Almarashdeh, I.; Bouzkraoui, H.; Azouaoui, A.; Youssef, H.; Niharmine, L.; Rahman, A.; Murimo, B.M. An overview of technology evolution: Investigating the factors influencing non-bitcoins users to adopt bitcoins as online payment transaction method. *J. Theor. Appl. Inf. Technol.* **2018**, *96*, 3984–3993.
75. Alshamsi, A.; Andras, P. User perception of Bitcoin usability and security across novice users. *Int. J. Hum.-Comput. Stud.* **2019**, *126*, 94–110. [CrossRef]
76. Androulaki, E.; Karame, G.O.; Roeschlin, M.; Scherer, T.; Capkun, S. Evaluating user privacy in bitcoin. In *International Conference on Financial Cryptography and Data Security*; Springer: Berlin/Heidelberg, Germany, 2013; pp. 34–51.
77. Bello, G.; Perez, A.J. Adapting financial technology standards to blockchain platforms. In Proceedings of the 2019 ACM Southeast Conference, Kennesaw, GA, USA, 18–20 April 2019; pp. 109–116.
78. Diniz, E.H.; Siqueira, E.S.; van Heck, E. Taxonomy of digital community currency platforms. *Inf. Technol. Dev.* **2019**, *25*, 69–91. [CrossRef]
79. Elkamchouchi, H.; Abouelseoud, Y. Privacy protecting digital payment system using ID-based blind signatures with anonymity revocation trustees. In Proceedings of the 2008 International Conference on Computer Engineering & Systems, Cairo, Egypt, 25–27 November 2008; pp. 274–280.
80. Mai, F.; Bai, Q.; Shan, Z.; Wang, X.; Chiang, R. From bitcoin to big coin: The impacts of social media on bitcoin performance. *SSRN Electron. J* **2015**, 1–46. Available online: https://www.semanticscholar.org/paper/The-Impacts-of-Social-Media-on-Bitcoin-Performance-Mai-Bai/57344ccfe492af1ccfa05496ab2d4ef534ba632a (accessed on 8 November 2022). [CrossRef]
81. Thawre, G.; Bahekar, N.; Chandavarkar, B.R. Use Cases of Authentication Protocols in the Context of Digital Payment System. In Proceedings of the 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Kharagpur, India, 1–3 July 2020; pp. 1–6.
82. Wang, J.; Xue, Y.; Liu, M. An analysis of bitcoin price based on VEC model. In Proceedings of the 2016 International Conference on Economics and Management Innovations, Wuhan, China, 9–10 July 2016.
83. Wijaya, D.A. Extending asset management system functionality in bitcoin platform. In Proceedings of the 2016 International Conference on Computer, Control, Informatics and its Applications (IC3INA), Tangerang, Indonesia, 3–5 October 2016; pp. 97–101.
84. Experian. Credit Cards Matched to Your Credit Profile—Experian. 2021. Available online: https://www.experian.com/credit/credit-cards/ (accessed on 8 November 2022).
85. Ankit, S. Factors influencing online banking customer satisfaction and their im- portance in improving overall retention levels: An Indian banking perspective. *Inf. Knowl. Manag.* **2011**, *1*, 45–54.
86. Chen, L.D.; Nath, R. Determinants of mobile payments: An empirical analysis. *J. Int. Technol. Inf. Manag.* **2008**, *17*, 9–20.

87. Lucarelli, S.; Sachy, M.; Brekke, K.J.; Bria, F.; Giuliani, A.; Gentilucci, E.; Idir, G. *D3.4 Field Research and User Requirements Digital Social Currency Pilots*; D-CENT: Seoul, Republic of Korea, 2014.
88. Deng, R.; Ruan, N.; Zhang, G.; Zhang, X. FraudJudger: Fraud Detection on Digital Payment Platforms with Fewer Labels. In Proceedings of the International Conference on Information and Communications Security, Chongqing, China, 17–19 September 2019; Springer: Cham, Switzerland, 2019; pp. 569–583.
89. Kolodiziev, O.; Mints, A.; Sidelov, P.; Pleskun, I.; Lozynska, O. Automatic Machine Learning Algorithms for Fraud Detection in Digital Payment Systems. *East.-Eur. J. Enterp. Technol.* **2020**, *5*, 107. [CrossRef]
90. Shen, H.; Kurshan, E. Deep Q-network-based adaptive alert threshold selection policy for payment fraud systems in retail banking. *arXiv* **2020**, arXiv:2010.11062.
91. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User acceptance of information technology: Toward a unified view. *MIS Q.* **2003**, *27*, 425–478. [CrossRef]
92. Shah, P.; Dubhashi, M. Review Paper on Financial Inclusion-The Means of Inclusive Growth. *Chanakya Int. J. Bus. Res.* **2015**, *1*, 37–48. [CrossRef]