FACTORS SHAPING THE CASHLESS PAYMENT ECOSYSTEM: UNDERSTANDING THE ROLE OF PARTICIPATING ACTORS

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Abstract Cashless payments have become increasingly popular around the world because of their numerous advantages. More so, the cashless payment adoption has been escalated during the Covid-19 pandemic. However, there is a lack of holistic studies on the adoption and contemporary practices of cashless payments. The purpose of this study is, therefore, to provide a comprehensive understanding by identifying the participating actors and their crucial role in the payment ecosystem. Thus, the paper aims to address two research questions: i) Who are the participating actors in the cashless payment ecosystem? and ii) What are the determinant factors for the actors to adopt the cashless payment ecosystem? Through scoping literature review of 63 articles published in the last seven years (2015-2021), six participating ecosystem actors are identified with their determinant factors. The study contributes towards addressing adoption issues and serves as a basis for future empirical investigation.

1 Introduction

Due to the revolution of Information and Communication Technologies (ICTs) and the proliferation of the internet, we are witnessing an increasingly growing trend in cashless transactions (Fabris, 2019). Cashless payment means any type of electronic payment that is made without using physical currency (Sreenu, 2020). In a cashless society the use of cash has been minimised, and people mostly use non-cash payment instruments in conducting their transactions (Xena & Rahadi, 2019). In this context, it is a financial transaction in which the end-user does not need to have any cash in order to complete the purchase, and, instead, uses digital payment methods which can be broadly categorised into card payments, electronic payments, mobile payments (Rahman, Ismail, & Bahri, 2020) and cryptocurrencies (DeVries, 2016; Shahzad et al., 2018). Cashless payment adoptions vary in terms of maturity and penetration from country to country. In most developing countries, the adoption rates are marginal (Eelu & Nakakawa, 2018; Patil, Rana & Dwivedi, 2018). However, there are others such as Kenyan M-PESA and Ghanaian FinTech which have been successful in shaping financial inclusion (Senyo et al., 2022; Van Hove & Dubus, 2019). In the Scandinavian countries, the cashless payment systems have become a norm. For instance, Sweden is becoming the world's first cashless society and serves as a role model for many countries (Engert & Fung, 2017; Fourtane, 2020).

Cashless payments have become the crucial component of the global economy (Kabir, Saidin, & Ahmi, 2017), and increase in access and usage of cashless payment leads fairly directly to an increase in economic growth (APEC, 2015). Going cashless is a global trend because adopting cashless payment has numerous benefits, such as helping to reduce suspicious transactions of money, circulation of fake currency, and combating money laundering to crackdown on organised crime (Arvidsson, 2019a; Jamsheer, 2018). Moreover, Covid-19 has changed consumer payment preferences. For example, digital wallets and 'Buy Now Pay Later' (BNPL) are taking the world by storm while cash payment is taking a backseat (Worldpay, 2021). Many countries began to experience a rise in cashless transactions during the pandemic as they changed to cashless methods of payment to reduce the risk of infection from handling cash (Jaafar, 2020). As per the Global Payments Report, the use of cash has reduced by 32% since 2019. Consumers are moving away from cash with record speed and the pandemic has accelerated the decline of cash by 42% over three years (Worldpay, 2021), whereas, electronic payment has seen the highest growth rate in

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five years at 19%. The ever increasing cashless payment frequency comprises electronic money being injected into the global intertwined system, which consists of multiple actors. The new era demands platformification, and firms can unleash full market potential by embracing open ecosystems (Capgemini, 2022). This stimulates us to identify the relevant actors and better understand their determinant factors as the cashless payment ecosystem is central in today's society (Henningsson & Hedman, 2014). It is necessary to develop the theoretical achievement against the pragmatic nature of the cashless payments as it has become one of the society's most innovative and dynamic sectors with technology-led competition as the new normal (Hedman & Henningsson, 2015).

There is ample research on the adoption of cashless payment (e.g., Manrai, Goel & Yadav, 2021; Patil et al., 2018; Qiu, Shi & Zheng, 2019). These studies frequently used well-established technology diffusion theories such as Technology Acceptance Model (TAM) (Davis, 1989), Unified Theory of Adoption and Use of Technology (UTAUT) (Venkatesh et al., 2003) or an extension of these two theories (e.g., Salloum & Al-Emran, 2018) to examine the factors influencing the adoption of cashless payment. However, the models are limited to studying how users come to adopt and accept a technology like cashless payment systems. The influencing factors found through these models are not sufficient to establish a sustainable multi-sided market of cashless payment. There is a lack of insight into the roles of the participating actors in the ecosystem. Moreover, the previously developed conceptual models from adoption factors are either integration of other models or single actor-focused. For instance, Jaafar (2020) integrated UTAUT and the Health Benefit Model to evaluate the adoption of e-payments and Oney, Guven and Rizvi (2017) developed a conceptual model to examine the same from consumers' perspective. Guo and Bouwman (2016) developed a three-tier mobile payment ecosystem model from the merchants' perspective. Senyo et al. (2022), on the other hand, focused on the payment service providers' perspective such as FinTech ecosystem whereas Eelu and Nakakawa (2018) designed a framework towards adoption of e-payment in a developing economy by extending TAM model.

According to our literature search, there is a lack of model which captures a holistic view of the cashless payment ecosystem and highlights the critical roles of different actors involved. This study, therefore, aims to provide a comprehensive view about the crucial role of the actors in the cashless payment ecosystem and factors that

influence their adoption. As such, through the scoping review method, this paper addresses to answer two research questions: *i) Who are the participating actors in the cashless payment ecosystem?* and *ii) What are the determinant factors for the actors to adopt the cashless payment ecosystem?*

2   Methodology

This study followed a scoping review process suggested by Peters et al. (2015). Scoping review is an appropriate approach for seeking and mapping the evidence in broad topic areas, particularly to identify and examine factors related to a particular concept (Peters et al., 2015). It aims to map the key concepts underpinning the research area, especially where the research area is complex or has not previously been comprehensively reviewed. Through the use of scoping review, we are able to inform a best practice model (Munn et al., 2018) and identify the concepts in the studies, and be able to map, report or discuss the generated concepts (Arksey & O'Malley, 2005).

2.1   Search strategy

The search process was initially conducted using two scientific databases - Web of Science and Scopus, and then complemented the search with Google Scholar to include grey literature such as company white papers and reports. For the purpose of accuracy and reach and to get only the relevant articles that focus on the factors of cashless payment, the keywords were combined using the search string AND/OR operators and wild card "*" was used to include possible segments after the phrase which produced the following search strings: ("cashless payment*" OR "digital payment*" OR "electronic payment*" OR e-payment* OR "contactless payment*" OR "mobile payment*" OR "paperless payment*") AND (factor* OR determinant*) AND (society* OR ecosystem*). We searched these keywords in the title for the quest for accuracy in the search results. The articles were selected based on the following five criteria: i) Journal articles and conference proceedings published during the past seven years (2015-2021) complemented by the latest company whitepapers, to focus our review on contemporary literature; ii) Written in English; iii) Discussing the determinant factors of cashless payment systems; iv) Studies on adoption, use and acceptance of cashless payment systems; and v) Full-text content access for reading and downloading.

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The initial search retrieved 183 articles in total. After removing the duplicates, 104 articles remained for examination. We applied criteria iii, iv and v through reading the articles' title and abstract and excluded 25 articles that did not fulfil the set criteria and another 7 articles were removed because the full content of those articles was not accessible for reading. Seventy-two full-text articles were assessed by applying criteria iii and iv through a thorough reading of the articles' full content and examining the aims and objectives, methods, results and conclusions to mainly assess the quality of the paper. Sixteen articles were excluded because the studies proved irrelevant to the objective of this study as they either discussed technical aspects or factors affecting the 'continuance usage intention' of digital payment (e.g., Ayo et al., 2021; Poerjoto, Gui, & Deniswara, 2021). Fifty-six articles remained after assessing the eligibility. The final list of articles was gathered after conducting snowball sampling by searching through the references of these 56 articles. Another 7 new articles were added and, in total, by combining these two sets of relevant articles, 63 articles were finally included for this review.

2.2   Data analysis

The study focused on generating concepts by synthesising existing research on the adoption of cashless payment systems. Data from the selected 63 articles have been extracted for the scoping review referred to as "charting the results". The data were extracted into a draft charting table (excel sheet) developed to record characteristics of the included studies and the key information relevant to the research questions (e.g., study aims, actors, determinants or factors, key concepts, and findings, etc.). The study used concept mapping as a general method to describe the cashless payment ecosystem in a more comprehensive and holistic visual diagrammatic form. Thus, concepts required to explain & describe the payment ecosystem were mapped out and the results were presented as a 'map' of data in a tabular and diagrammatic format (see Figure 1). Open coding was utilised whereby we carefully scrutinised all the selected articles and recorded the determinant factors and ultimately contrasted these concepts and grouped them under the identified actors based on their relevance and relationships.

3   Results and Discussions

In this section, we detail the results based on our two research questions.

3.1   Participating actors of the cashless payment ecosystem

According to (Walsham, 1997), actors can be both human and nonhuman, such as technological artefacts linked by associations of heterogeneous networks of aligned interests, including people, organisations and standards. At the centre of every ecosystem, an actor is capable of using structural capabilities to interact in creative or innovative ways in order to co-create value (Tronvoll, 2017). An ecosystem consists of a set of interdependent actors and factors coordinated in a particular way whereby they enable productive innovation (Stam & Spigel, 2016). We have found that digital payments have become a popular spot for innovation. It is not only the internet giants, such as Google, Apple, Facebook, and Alipay, and FinTech companies, such as PayPal, Square, iZettle, etc., who have entered the market, but also, there are other prominent actors who contribute to the whole ecosystem. Thus, through synthesis of the retrieved articles, we identified the following six participating actors.

Consumers include the end-users, such as individuals, organisations, etc., who benefit from using the cashless payment systems. They are considered as the trigger of a cashless ecosystem (Liu, Kauffman, & Ma, 2015). Their acceptance and usage can trigger other actors to adopt cashless payments. For them, cashless payment can increase convenience, save time, and allow them to experience new innovations (Acheampong, 2017).

Merchants are the businesses such as 'brick-and-mortar' and other retailers etc., who accept cashless payment. The digital payment market is multi-sided as such a payment method being adopted by consumers should be accepted by merchants and other stakeholders to be used for transactions.

Service providers refer to the various entities who have a business interest in replacing cash payments with electronic payments (Arvidsson, 2019b). These industries include conventional banks; nonbanks; Fintech companies; card providers like Visa and Mastercard; telecom companies such as Apple and Samsung; e-

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commerce companies like Alibaba and Amazon; cryptocurrency providers as well as providers of hardware and software solutions for electronic payments (Arvidsson, 2019a).

Media and content promoters are among the important players of the ecosystem that can greatly influence and promote cashless payments. A large majority of the online public are communicating through a new medium called 'social media' where members share, engage and collaborate with their peer groups to build lasting relationships in the virtual world. Some of the popular social media sites include mainstream social networking sites like Facebook and Google, professional networking sites like LinkedIn, blogs like WordPress and BlogSpot, video sharing websites like YouTube, microblogging sites like Twitter etc.

Regulators and policymakers are critical participants of the cashless payment ecosystem. The actors include the regulatory bodies and policymakers such as central banks and other governmental financial institutions related to the legislature of payment services (Senyo et al., 2022). These actors mainly create safe and conducive environments for the other ecosystem participants to thrive.

Infrastructure is one of the main drivers for the ecosystem and is about building a secure and reliable physical network to provide cashless payment nationwide. It plays a major role in expansion of cashless payment services which include internet connectivity, power supply, cloud computing, blockchain, cybersecurity, etc. Cashless payment itself is a technology which does not involve physical cash as the payment is done through electronic medium (Vinitha & Vasantha, 2017). Infrastructure becomes the key player as consumers and merchants demand safeguards from fraud and identity theft (Capgemini, 2022).

These six actors as described above are interlinked, and each actor has a participating role in the ecosystem in terms of collaboration and coopetition, which is essential as their roles determine the factors influencing the adoption of cashless payment (Blach & Klimontowicz, 2021). The next section presents the factors determining their adoption of the cashless payment ecosystem.

3.2   Determinant factors for the adoption of cashless payment ecosystem

Table 1-6 below shows the factors that determine cashless payment adoption for each actor with references.

3.2.1   Consumers

Out of 63 studies reviewed, 31 articles investigated factors influencing consumers' adoption (Table 1). Most articles discussed *'trust'* and *'security'* as the factor for consumers' adoption of cashless payment systems (e.g., Shahzad et al., 2018; Barkhordari et al., 2017; Patil et al., 2018; Qiu et al., 2019). The effects of trust and security on the use of cashless payment have long been recognised in e-commerce literature. This is mainly because the transactions are done through electronic medium using technology such as cryptocurrency like bitcoin (Shahzad et al., 2018) and others which does not involve physical cash (Vinitha & Vasantha, 2017). This is also the reason why it is an unavoidable fact that *'perceived risk'* is associated with the cashless payment systems and influences the adoption decision of the consumers (e.g., Dahab & Bouqlila, 2022; Singh et al., 2019).

The users' trust factor is also impacted by other adoption factors such as system quality, service quality and information quality (e.g., Jocevskia, Ghezzib, & Arvidsson, 2020; Tiwari & Singh, 2019). Trust related to payments is closely linked to information security and data privacy of consumers when making transactions in e-commerce (Sutia et al., 2020). Consumers have a greater tendency to adopt cashless payment when they feel secure about their personal information shared through cashless payment systems. Therefore, cybersecurity is critical as payment data become agile in the open finance future (Capgemini, 2022). Further, past experience has been found to be the common determinants of perceived security and trust (e.g., Dahab & Bouqlila, 2022; Oney et al., 2017; Singh et al., 2019). Consumers' trust is also affected by their own acquaintance; they trust electronic payment tools they know better (Zizhou et al., 2019).

Existing technology diffusion theories (e.g., TAM and UTAUT) have been extensively used to examine consumer' adoption of cashless payment (e.g., Al-Okaily et al., 2020; Manrai et al., 2021). The *'perceived usefulness'* and *'ease of use'* were the most important factors highly associated with the adoption of cashless payment systems

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(e.g., Al-Dmour et al., 2021; Frączek & Urbanek, 2021). For instance, "perceived ease of use" is a significant factor influencing consumers' use of tap-and-go payment in the USA (Bailey et al., 2020; Chadha, 2018).

Table 1: Determinant factors for Consumers

Factors	References
-Trust & Security - Perceived Risk - Data privacy - Ease of Use - Performance expectancy - Social influence - Facilitating conditions - Cost - Demography	Dahab and Bouqlila (2022); Mahmoud and Yaseen (2021); Qiu et al., 2019; Patil et al. (2018); Shahzad et al. (2018); Barkhordari et al. (2017); Oney et al. (2017); Rohimah et al. (2019); Al-Okaily et al. (2020); Sutia et al. (2020); Mensah et al. (2021); Singh et al. (2019); Vinitha and Vasantha (2017); Frączek and Urbanek (2021); Al-Dmour et al. (2021); Ladkoom and Thanasopon (2020); Kabir et al. (2017); Kumar et al. (2020); Rahman et al. (2020); Ibidunmoye (2018); Manrai et al. (2021); Arvidsson et al. (2016); Jocevskia et al. (2020); Capgemini (2022); Swiecka et al., 2021; Nadler et al., 2019; Lohana and Roy (2021); Khurana et al. (2019), Tiwari and Singh (2019); Bailey et al. (2020); Chadha (2018)

The consumers' adoption to cashless payment is positively influenced by performance expectancy (PE), social influence and price value. PE means, the individual believes that using the cashless payment system will help to attain gains in work performance (Venkatesh et al., 2003) which is similar to the perceived usefulness factor. There is a positive relationship between PE and adoption of cashless payment systems. Consumers who believe cashless payments will increase their overall work performance are willing to adopt cashless payments (e.g., Al-Okaily et al., 2020; Mensah et al., 2021). The 'social influence' factor, "the degree to which an individual perceives the importance of others to believe that he or she should use the new system" (Venkatesh et al., 2003, p. 451) serves as the determinant for consumers to frequently use cashless payment. Similarly, other peoples' views and opinions such as peers' and friends' opinions play an important role in the acceptance of cashless payment (e.g., Singh et al., 2019; Ibidunmoye, 2018).

The 'price value or cost' is an important factor when it comes to consumers' choice of cashless payment systems such as mobile payment (Al-Okaily et al., 2020). This factor is consistent with many other studies (e.g., Jocevskia et al., 2020; Kabir et al., 2017; Zizhou et al., 2019). Similarly, 'facilitating conditions' are necessary to use cashless payments (Rahman et al., 2020). The more consumers have knowledge and resources to use cashless payment, the more they are willing to adopt it. This finding is also in line with other researchers (e.g., Al-Okaily et al., 2020; Manrai et al., 2021). Further, the demographic factors influence consumers' adoption (e.g., Gong et al., 2017; Khurana et al., 2019; Lohana & Roy, 2021). For instance, education level as an individual demographic variable has a significant relationship with the intention of the adoption of cashless payment service while age and gender were found insignificant (Al-Dmour et al., (2021).

3.2.2   Merchants

Out of 63 studies, 10 discussed factors influencing merchants' cashless payment adoption (Table 2). Since merchants are mostly profit-oriented businesses, their choice of payment service largely depends on direct 'cost' and 'revenue' of each payment service (Arvidsson, Hedman, & Segendorf, 2016). The other important factors that determine their decision to accept cashless payment include merchants' background, such as age, number of credit cards held, use of computers, etc. and merchants' business characteristics (e.g., business sector they belong to, total value of transactions per month, average value of transaction, profit margin, location of business) and effects of other players' decisions via the merchant's perception (including the merchant's perception of customers' use of cards and competitors' participation in the card scheme). There is positive relationship between merchants' stated preferences with consumers' revealed preferences (Huynh, Nicholls, & Nicholson, 2019). Studies on small and medium-sized businesses (SMBs) focusing on SMBs' adoption of contactless payments apps including Apple Pay, Masterpass, WeChat Pay and Alipay etc. show that merchants often perceived credit cards to be most costly in terms of fees and concluded that merchants' adoption of cashless payment is highly determined by cost and revenue (Arvidsson et al., 2016; Huynh et al., 2019; Kosse et al. 2017).

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Table 2: Determinant factors for merchants

Factors	References
-Cost & Revenue -Trust & Security -Perceived Risk -Perceived usefulness -Perceived ease of use -Merchants' background (e.g. age, number of credit cards held, use of computers) -Business characteristics (e.g. sector it belongs, value of transaction, profit margin, business location) -Merchants' perception (on customers' use of cards and competitors' participation in the card scheme)	Nuryyev et al. (2021); Arvidsson et al. (2016); Moghavvemi et al. (2021); Xena and Rahadi (2019); Huynh et al. (2019); Kosse et al. (2017); Fontes et al. (2017); Jonker (2018); Frączek and Urbanek (2021); Yeboah et al. (2020)

The cost and revenue factors are also applicable for merchants who adopt cryptocurrency payments. The other factors related to their cryptocurrency adoption include 'consumer demand' where consumers desire to pay with cryptocurrencies, 'lower transaction cost' and 'perceived efforts' required for the adoption (Jonker, 2018). Similarly, cryptocurrency payment adoption by merchants in the hospitality business was influenced by 'perceived usefulness' which in turn is affected by trust, risk, and security and 'perceived ease of use' which is affected by risk and convenience (Nuryyev et al., 2021). Similar factors were also found true for the merchants from passenger transport of European Union countries (Fontes et al., 2017; Frączek & Urbanek, 2021).

One of the most used factors affecting the merchants' adoption of digital payment is the 'perceived risk' which is defined as "the potential for loss in pursuit of a desired outcome of using an e-services" (Featherman & Pavlou, 2003, p. 454) as "the uncertainty about what the innovation gives" (Gerrard & Cunningham, 2003, p. 19). Risk is one of the main reasons why merchants avoid a new digital payment system like cryptocurrency. Perceived risk of cashless payment technologies includes security risk, third party service failure risk, risk of user error, risk of privacy loss, risk of counterparty fraud, and risk of illicit association (Nuryyev et al., 2021). For example, perceived risk of a cryptocurrency payment negatively impacts perceived

security, which is considered a strong predictor for a new payment technology adoption (Fontes et al., 2017).

The determinants such as payment processing time and fees, convenience and enhanced payment security features are motivating merchants to adopt m-payment while technological incompatibility, complexity, the cost of investment and the lack of critical mass and knowledge are some of the factors discouraging merchants (e.g., Moghavvemi et al., 2021). Therefore, service providers and technology characteristics are considered the two dimensions that could influence merchant adoption. For instance, 'trust' is a critical factor for merchants' adoption due to the security risk. Thus, sufficient trust-building strategies from service providers are essential for adoption of mobile payment by merchants (e.g., Yeboah et al., 2020).

3.2.3 Service providers

Out of 63 articles reviewed, 16 discussed factors influencing service providers' adoption of cashless payments (Table 3). Payment service providers ensure that the services they provide are simple and friendly to operate, satisfy customers' needs, build trust by protecting accounts from frauds and make the payment affordable to positively influence consumers and other stakeholders to adopt payment services (Narteh, Mahmoud, & Amoh, 2017). Moreover, new technologies and innovations have opened up opportunities for service providers to enter the cashless payment ecosystem. Thus, one of the main factors for them to adopt cashless payment will largely depend on their *'capacity to innovate'* (APEC, 2015; Senyo et al., 2022). This factor, which concerns the innovative products and services, is stimulated by change in regulations and presence of payment infrastructure. For example, in Sweden, the second Payment Service Directive (PSD2) issued by the European Union is changing the payment landscape. The PSD2 is aimed at increasing competition and to stimulate innovation by institutionalising payment industries characterised by open banking (Arvidsson, 2019b; Waalan & Olsen, 2019). This open banking concept creates open platforms whereby payment service providers such as conventional banks and FinTech companies provide competitive services from which consumers and merchants can select payment services as per their own preference. Thus, meeting the *'consumer and merchant satisfaction level'* in terms of *'supplying competitive services'* becomes a determinant factor for the service providers to take part in the cashless payment ecosystem (Arvidsson, 2019b; Tiwari & Singh,

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2019). Service providers also nurture merchants' trust because merchant trust in them acts as a fundamental enabler for the adoption of digital payments (e.g., Arvidsson, 2019b; Yeboah et al., 2020).

Table 3: Determinant factors for Service Providers

Factors	References
- Capacity to innovate - Consumer and merchant satisfaction level - Supplying competitive services - Collaborative practices - Customer base - Marketing capabilities	Bailey et al. (2020); Chadha (2018); The Federal Reserve (2022); Nery (2021); Ozili (2021); Engert and Fung (2017); Ozturkcan (2019); Armelius et al. (2020); Söderberg (2019); Waalan and Olsen. (2019); Arvidsson (2019b); APEC (2015); Senyo et al. (2022); Tiwari and Singh (2019), Yeboah et al. (2020); Narteh et al. (2017)

The other factor affecting cashless payment adoption for service providers such as FinTech firms, Telcos and banks is the *'collaborative practices'* whereby they have to build relationships amongst the stakeholders and subscribe to a collaborative model to deliver innovative payment service (Senyo et al., 2022). Collaboration between the cashless payment ecosystem actors is necessary to realise coopetition, i.e., stimulating competition while at the same time ensuring the growth of cashless platforms that yield economies of scale and scope as well as interoperability and open access. The service providers' determinants, such as *competition and innovation* can stimulate start-ups in the FinTech and Regtech industries, e.g., related to cryptocurrency technologies such as blockchains (APEC, 2015; Arvidsson, 2019b). The central banks across the world have started launching national digital currencies to replace cash and have become one of the cashless payment service providers. This development not only fosters competition and innovation but also ensures the fundamental security and efficiency of the monetary system (Armelius et al., 2020; Ozturkcan et al., 2019).

The factors such as *'presence of foreign competitors'* could be the trigger because the entrance of large IT companies, such as Google, Apple and Facebook, into the payment market are increasingly issuing their own private digital currencies. For

example, in Sweden, the central bank is issuing its own digital currency in competition since a successful penetration by a multinational digital currency would pose a fundamental challenge to the Swedish monetary system. Launching an e-krona would help ensure that all individuals have access to an efficient, convenient, and secure means of payment (Armelius et al., 2020; Ozturkcan et al., 2019). The central banks have an interest in the efficiency of the payments system and, as a payment service provider, they are influenced by factors of *'increase in contestability and efficiency in payments'* (Engert & Fung., 2017). They are also motivated by other factors such as 'promotion of financial inclusion' (Ozili, 2021), especially in developing countries. There are also examples of other payment systems providing financial inclusion besides the central banks such as M-PESA in Kenya and Modelo in Peru (Engert & Fung, 2017).

The nonbank e-money providers are another form of payment service providers. Nonbanks are not licensed as banks but provide loans, money transfers and other financial services that are normally offered by conventional banks. They include financial institutions such as insurance companies and pension funds, finance companies, broker-dealers, money market funds, hedge funds, other investment funds and central counterparties (Aldasoro, Huang, & Kemp, 2020). "Nonbank money is digital money held as balances at nonbank financial service providers" (The Federal Reserve, 2022, p.5). They conduct balance transfers on their own books using a range of technologies such as mobile apps (The Federal Reserve, 2022). M-PESA e-payment is an admirable success story which has expanded access to basic financial services to millions of underserved Kenyans in Africa (Nery, 2021). Its financial service provider, Safaricom, Kenya's largest mobile network operator, was able to reach the customers with affordable payment service because of three success factors, namely, their existing customer base, marketing capabilities and physical distribution infrastructure (Nery, 2021).

3.2.4   Media and content promoters

The media and content promoters are critical for the payment ecosystem to promote and market cashless payment systems. Eight studies have discussed their adoption factors (Table 4). For example, Singh et al. (2019) drew insights from Twitter analytics to study adoption of digital payments in India and found that social media marketing is used for the promotion of digital payment systems. Twitter is

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extensively used by payment service providers to make the consumers aware of their products as well as using Twitter as a platform to promote themselves (Singh et al., 2019).

Table 4: Determinant factors for media and content promoters

Factors	References
- Point-of-purchase communication - Reassurance advertising e.g., TV commercials - Social influence e.g., Experts' opinions, Social media influencers, Word-Of-Mouth - Awareness of Products & Services - Awareness of Payment Technology	Singh et al. (2019); Narteh et al. (2017); Koenig-Lewis et al. (2015); Darma and Noviana (2020); Kalinic and Marinkovic (2016); Bailey et al. (2020); Kaur et al. (2020); Nguyen (2018)

Apart from the social media networking, the cashless payment service providers use different communication channels to deliver messages such as *'Point-of-purchase communication'* where payment service providers like banks, FinTech companies, Telcos, etc., display banners, posters and billboards that highlight the advantages of cashless payments. The digital payment products and services are also promoted through catalogues, booklets and leaflets containing clear information about the available services targeted to the consumers in retail stores, bank offices, shopping malls, cinemas and mobile phone stores (Nguyen, 2018). Promotions are also distributed through television as 'TV commercials' and on the radio. The cashless payment providers incorporate their services in TV programmes, movies, and financial and technological events to reach out to their consumers recommending available payment technologies (Nguyen, 2018). For instance, it was found that attitude towards digital payment was negatively impacted by perceived risk and trust; therefore, service providers use 'TV commercials' to show that digital payment systems are being accepted by various retailers and used by other consumers. This reassurance advertising proved persuasive given that socio-cultural influence also has a strong influence on attitude towards cashless payment (e.g., Bailey et al., 2020).

One of the factors related to Media and Content Promoters is the 'social influence' (Narteh, Mahmoud, & Amoh, 2017; Bailey et al., 2020). This includes both external and interpersonal social influence. External social influence includes non-personal information such as mass media reports, expert opinions, etc., and the interpersonal

social influence refers to word-of-mouth from peer groups (Bailey et al., 2020; Kaur et al., 2020). For example, social influence had a positive impact on use of e-payment among Serbian consumers (Kalinic & Marinkovic, 2016) and reduced the perceived risk of mobile payment adoption among young French consumers (Koenig-Lewis et al., 2015).

3.2.5   Regulators and Policymakers

Fourteen articles discussed regulators and policymakers as participants in the cashless payment ecosystem (Table 5). They are critical for the smooth functioning of ecosystem. These actors frame the payment system policies and regulate them. The US Federal Reserve report 2022 states that for a nation's economy to function smoothly, the citizens must have confidence in the nation's money and payment services. The central banks as regulators work towards maintaining public trust and confidence by fostering monetary and financial stability and implementing safe and efficient payment system (The Federal Reserve, 2022). Thus, a *well-functioning and trustworthy payment policy framework* should be assured by the central bank which is viewed as a public good that warrants direct involvement of the regulatory body of the state. The government as a statutory body maintains a stable store of value and unit of account, and ensures that the payment system is safe, efficient and inclusive (Armelius et al., 2020; Senyo et al., 2022; The Federal Reserve, 2022). Further, the government has the role to protect personal integrity by ensuring that personal data generated by commercial companies during the purchases are not stored and misused for commercial purposes (Armelius et al., 2020).

Table 5: Determinant factors for Regulators and Policymakers

Factors	References
- Policy framework (Well-functioning and trustworthy payment policy) - Financial inclusion Policy - IT Governance - Conducive environment - Effective legal system	Danchev et al. (2020); Rohimah et al. (2019); Soutter et al. (2019); Singh et al. (2019); Senyo et al. (2022); Akanfe, Valecha, and Rao (2020); Arvidsson (2019a); The Federal Reserve, 2022; Armelius et al., 2020; Waalan and Olsen. (2019); Singh et al. (2018); Nguyen (2018); Kaur et al. (2020); Xena and Rahadi (2019); Ladkoom and Thanasopon (2020)

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The policy makers such as governments or central banks should be context specific, sensitive and have a positive impact on the other actors of the ecosystem. They work in coordination with the other players, like private and public financial institutions and payment service providers, to frame policies on innovative technology systems (Singh et al., 2018).

The regulators and policymakers establish a payment system that works for all individuals in society. They ensure regulations in place to build ICT infrastructure through which payment service providers can provide affordable and secure cashless payment systems. In the same way, through policy change, the policymakers create *'conducive environments'* for the new businesses to foster market entry which enhance cashless payment solutions. They also focus on implementing efficient legal framework whereby it takes less time and resource in settling disputes related to cashless payment systems (APEC, 2015). Financial inclusion (Frączek & Urbanek, 2021; Kabakova & Plaksenkov, 2018) is one of the primary factors for the policymakers when it comes to policy implementation relating to cashless payment systems. The financial inclusion policy and regulatory issues exist not only in the developing countries but also prevail in the developed cashless leading nations (Waalan & Olsen., 2019). Certain groups in society, such as the elderly and groups with different forms of disability, find it hard to pay with digital forms of payment. Moreover, in some countries, most retailers no longer accept cash as a payment (Waalan & Olsen., 2019). Therefore, it is the role of the governments or policymakers to develop policies ensuring financial inclusion for everyone in the society. The situation of digital divide leading to financial exclusion is unacceptable (Arvidsson, 2019a). Furthermore, payments run on trust; thus, it is crucial to enforce regulation and laws which ensure privacy and integrity for people to use digital payments (Arvidsson, 2019a). For example, Thai government initiated 'PromptPay' a national e-payment initiative to reduce the use of cash and catalyze the adoption of e-payment (Ladkoom & Thanasopon, 2020). Similarly, in Ghana, the Ghanaian central bank as a regulating body supported FinTech companies through providing licensing regime to regulate the payment ecosystem (Senyo et al. 2022).

3.2.6   Infrastructure

Eight studies highlighted the importance of infrastructure as a participating actor of cashless payment ecosystem (Table 6). The infrastructure in the context of digital platforms constitutes large-scale socio-technical projects that are aimed at the ubiquitous and reliable provision of a service (Plantin & De Seta, 2019). The internet network connectivity, smartphone penetration, power supply, biometrics, tokenisation, cloud computing, blockchain, cybersecurity, wearable technology, and the Internet of Things, etc., are some of the infrastructures relevant for cashless payments.

The 'internet connectivity' is essential for the cashless society to thrive and this is highlighted by many researchers (e.g., Jocevskia et al., 2020; Singh et al., 2018; Soutter et al., 2019). For example, the 'Chinese internet' is dominated by the search engine Baidu, an e-commerce site Alibaba, and a messaging software Tencent. These three internet companies operate and serve as an internet service provider for other infrastructural domains such as artificial intelligence, cloud computing, mobile payments and other financial services, etc., similar to Alphabet, Amazon and Facebook in the USA (Plantin & De Seta, 2019).

Table 6: Determinant factors for infrastructure

Factors	References
- Internet network connectivity (Smooth Payment network) - Digital ID scheme, - Biometrics - Cloud computing - Blockchain - Cybersecurity	Soutter et al. (2019); Singh et al. (2018); Vinitha and Vasantha (2020); Frączek and Urbanek (2021); Jocevskia et al. (2020); APEC (2015); Capgemini (2022); Plantin and De Seta (2019)

Infrastructure plays a key role in safeguarding consumers and merchants from fraud and identity theft. For example, contactless payments' popularity during the pandemic has prompted the need for a robust digital ID infrastructure (Capgemini, 2022). According to the World Payment Report 2022, digital ID infrastructure will be the key as payments become transparent (Capgemini, 2022). Across the world, governments are launching national identity initiatives. For instance, the European

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Commission will be launching an identity verification toolbox by September, 2022 and several other countries like Australia, Canada and New Zealand are following through. These infrastructural changes in the payment industry will help unify access and will facilitate regulations such as PSD2 and open banking to thrive on a shared and integrated digital ID scheme. For example, the National Institute of Standards and Technology (NIST) in the United States published new Digital Identity Guidelines (SP 800-63-3) to incorporate 'biometrics' for password-less authentication (Capgemini, 2022).

3.3   The Ecosystem

As shown in Figure 1, the cashless payment ecosystem has been brought into existence through the convergence of six actors with individual factors that determine their adoption of cashless payment. The first two actors, consumers and merchants, focus mainly on the actual 'demand side' of the cashless payment ecosystem as their adoption and usage of cashless payment are key to the thriving cashless payment ecosystem. They are influenced by the economic use of the various cashless payment technologies such as card payments, e-payments, mobile payments, cryptocurrencies. The factors such as trust and privacy, security and risk, cost and revenue, and 'ease of use' and usefulness; influence them to adopt the cashless payment system (e.g., Nuryyev et al., 2021; Qiu et al., 2019; Patil et al., 2018). On the other hand, the third actor, 'payment service providers', and fourth, 'media and content promoter' generally fall under the 'supply-side' of the cashless payment ecosystem.

Their adoption of cashless payment is influenced by economies' readiness to develop innovative cashless payment products and services. Their participation in the ecosystem is influenced by factors such as level of competitiveness, capacity to innovate, marketing capabilities, consumer and merchant satisfaction level, awareness of products and services (Bailey et al., 2020; Chadha, 2018; The Federal Reserve, 2022; Nery, 2021).
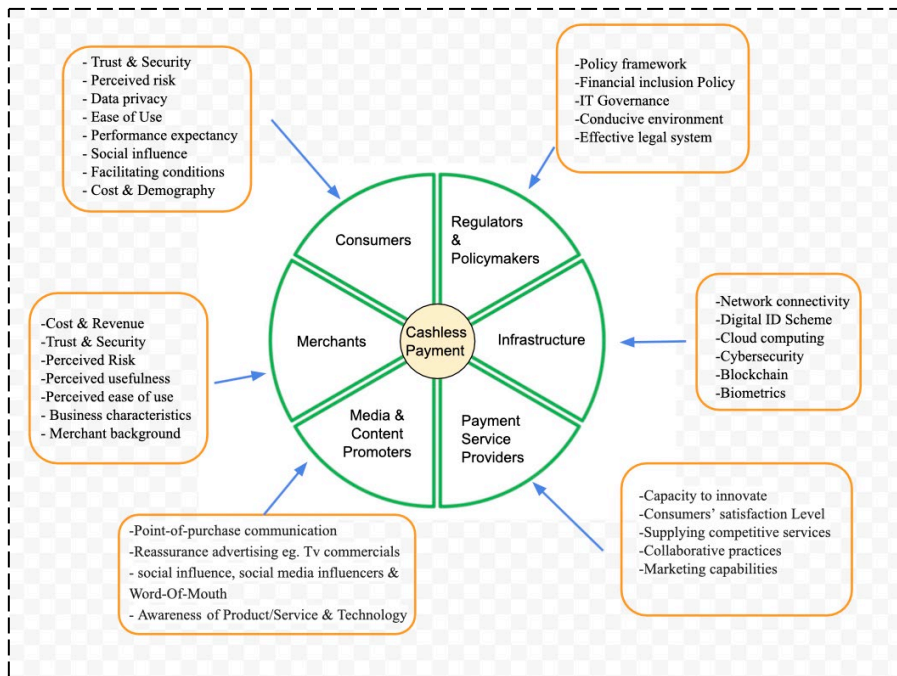
Figure 1: Determinant factors for the adoption of Cashless payment ecosystem

The fifth actor, regulators and policymakers focus on framing cashless payment system policies and regulations for smooth functioning and creating conducive environment. They provide the necessary IT governance and put in place the regulations and policies needed to build cashless payment infrastructure through which affordable and secure payment services can be provided. One of the main factors that determine the role of policymakers in the adoption of cashless payment system is that they implement payment policies that work for all, thus, financial inclusion policy is considered a critical factor when building cashless payment systems (e.g., Frączek & Urbanek, 2021; Kabakova & Plaksenkov, 2018). The cashless payment infrastructure is the sixth participating actor of the ecosystem. The expansion of cashless payment system mainly depends on reliable and secure physical network to cater across the society. The focus is on the reach and making available of the fundamental services required for the cashless payment system such as internet network connectivity, digital ID scheme, cloud computing, cybersecurity, blockchain etc.

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4   Conclusion

With the use of scoping literature review, six participating interlinked actors of the cashless payment ecosystem are identified: consumers, merchants, service providers, media & content promoters, regulators & policymakers, and infrastructure. These six key actors are considered to be the building blocks of a cashless payment ecosystem.. The study found that the consumers and merchants were mainly influenced by perceived trust and privacy, security and perceived risks, whereas the media & content promoters' adoption play a role on social influence and point-of-purchase communication. And similarly, the service providers were determined by their capacity to innovate new payment systems. For the regulators & policymakers, their role in adoption of cashless payment is determined by their ability to frame well-functioning and trustworthy payment policies leading to a conducive environment while the infrastructure focuses on providing reliable and secure physical network.

The paper contributes towards the existing literature by proposing an ecosystem which provides a holistic perspective of the cashless payment. The insights from adoption factors and the analytical ecosystem provide a comprehensive view and understanding of the crucial role each actor plays in the cashless payment ecosystem. These findings also provide some insight for policymakers to address existing adoption concerns for a successful transition towards a cashless society. Moreover, the proposed ecosystem can serve as a basis for further empirical investigation and validation by the future researchers.

This study has limitations as it only focuses on the identification of the ecosystem actors and their participation in adoption. Future study can be conducted to examine each actor in depth through empirical findings. The influencing factors for the actors can also be studied in detail by using mediating and moderating effects of independent and dependent constructs. There are also some opportunities for future studies. For instance, the issue of cashless payment adoption has been escalated due to the Covid-19 pandemic. However, its effect on the adoption is not covered in this study. Therefore, future researchers can focus on change in determinant factors or roles of the actors because of the pandemic.

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