



Mobile Payment Applications in Countries with Low Financial Inclusion: A Multi-stakeholder Perspective Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Mobile payment apps have become the most used mobile payment system, especially in underbanked regions. It has come to be the most viable way of promoting access to and use of quality financial services, at affordable cost. As far as review works on use/adoption of mobile payment apps in low financial inclusion countries go, presentation has been from users' perspective. Thus, under-emphasizing the challenges of other members of the m-payment app ecosystem. The work aims at describing such general challenges from the lenses of users, regulators and merchants of mobile payment apps. Also, pros and cons of some specific mobile payment apps in these regions are also provided in the work.

Place and Duration of Study: The review covered literature covering m-payment adoption in low financial inclusion countries i.e. Asian and African countries, spanning 2015 to 2023.

Methodology: In selecting the literature, we considered only journal publications considering specifically m-payment apps, and written in English. To achieve a measure of spread, major

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regions in the two continents were considered, and journal articles focusing on a particular country were limited to two.

Conclusion: We observe that the challenges of m-payment apps from users' perspective are mostly denser than other perspectives. Users' and regulators' concerns converge only so thinly. Only regulators' task of enlightenment of users/customer of about demonetization policies mirrors one of users' concerns, perceived trust. Users and merchants are both concerned with perceived risk and perceived ease of use concerns. The challenges of regulators as regards m-payment apps are quite dissimilar to those of merchants. In all, the observed disparate (or thin similarity of) concerns of the different m-payment app stakeholders strengthens the need for such an inclusive review done in this work.

Keywords: M-payment app ecosystem; financial inclusion; mobile payment app.

1. INTRODUCTION

Mobile payment is a payment means that uses smart phone devices that are enabled by media technologies such as quick response (QR) code, near field communication (NFC), one-time password (OTP) code, SMS, web API, mobile application or USSD, for financial transactions. Mobile Payments can also be carried out over cell phones with limited internet access [1]. This makes it a tool for giving financial service access to the low-income groups in underdeveloped and developing regions of the world [2],[3]. In recent times, the use of applications as technology (i.e. mobile payment applications or m-payment apps) has risen in popularity beyond SMS or USSD in India [4], and in Thailand [5], in terms of volume of transactions, user base and market share. Popularity of some have been because they offer payment support, cashback and rewards [6]. The reasons for this popularity is that a carefully crafted profitable business model has been adopted, driving interest of both users' and merchants', both stakeholders [6]. Implication is that for such competitive advantage secured so far by m-payment apps to be maintained, feedback from stakeholders must be routinely secured.

1.1 Justification for the Review

China is reported to lead globally in proximity of adoption of mobile payment having 81 percent of their smartphone users make payments using mobile payment apps in the past six months, while Denmark ranks second with usage rate of 41 percent [7-10]. To buttress this trend, mobile banking, also known as phone banking, and funds transfer have rising impact on e-commerce activities in developing countries while other modes of m-payment like ATM

and debit cards have dwindling impact on e-commerce activities [11]. This means that a large portion of mobile payment has been via mobile payment applications (m-payment apps). This is why this work focuses on what the limitations and challenges has been for m-payment apps. Furthermore, this work is centered on countries of low financial inclusion (mostly developing and underdeveloped countries) as they have highest figures of unbanked population, which represents the financially excluded [12,13]. Developed countries/economies on the other hand are facing saturated markets in terms of financial inclusion [14]. According to the 2017 Global Findex Survey, 26 percent of unbanked persons interviewed stated cost as deterrent to ownership of account, and some other fraction held distrust in the financial system [15]. This is why financial inclusion is presented multidimensionally to include having access to financial services, making use of same as well as cost and quality of financial services [16]. Mobile money services are highest in nations with dismal access to formal banking services [17,18]. In fact, Alipay, an m-payment app in China is used by a greater fraction of the unbanked and underbanked population than the banked [19]. In [14], countries identified with highest need for financial inclusion were held as best potential for digital financial services and Fintech growth. This is why we review mobile payments applications in low financial inclusion countries. Operation and development of mobile money, implications, costs and benefits of mobile money in Africa are presented in [20]. It was established in [21] that customers prefer m-payment apps over web-based payment apps. Also, people of younger demographic embrace m-payment apps more readily than the older age groups.

In summary, although there has been quite a number of literature that have reviewed challenges with adoption of m-payment applications in low financial inclusion or developing and underdeveloped countries, current situation of things has evolved a bit past their discussion emphases. A lot of developing countries are now in the growth phase, having gone past the introduction phase i.e. intention to use, one of the key usage adoption triggers, now means intention to use in the future, continuance intention and intention to recommend mobile payment services [22,23]. It means that factors controlling intention to use, which have previously been discussed mainly as user-centric, now represent the challenges with m-payment apps in such regions only partially. Other perspectives of these challenges are needed to complete the situation. This idea agrees with recommendation in [24] that there is paucity of literature that capture the factors directing the decision to use m-payment apps from other viewpoints other than that of users/customers, e.g. that of government/regulators and businesses providing this service. For emphasis, Pat et al [25] proved how pivotal contextual factors (like demonetization policy, crashing cost of internet) can be in promoting adoption of m-payment technology. Such contextual factors are user-centred. This is why the key contribution of this work is the discussion of the outlook of m-payment apps in regions of low financial inclusion from users', regulators' and merchants' perspectives, particularly challenges.

1.2 Review Methodology

As presented in Fig. 1, Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) model was adopted for the systematic review reported this study. It began with the identification of works published between 2015 to 2023, on the subject matter from major libraries viz: Springerlink, Elsevier, Taylor and Francis, IEEE and a few from other sources. For that identification, we searched the aforementioned libraries with varied combinations of the following keywords/phrases: “adoption”, “intention to use”, “m-payment apps”, “mobile payment applications”, “users”, “merchants”, “government”, “regulators”, “m-payment stakeholders” and We sought to retrieve 217 works, from which 16 were unavailable. For the final set of exclusion criteria the 201 papers were red in detail. We excluded papers not written in English and ones not focused on m-payment apps. We discovered that a lot of works discuss m-payment systems/platforms generally rather than a specific focus on m-payment apps. Most probably because m-payment app is just one of the many m-payment platforms, though the most popular. To achieve a measure of spread, major regions in the two continents were considered, and journal articles focusing on a particular country were limited to two. The study dataset comprised of a total of 30 works on adoption of m-payment apps in areas of low financial inclusion, mainly countries in Asia and Africa. As shown in Table 1, breakdown of the 30 works include 16 works studying challenges with adoption in Asia; and 14 works for Africa.

Table 1. Reviewed Literature

Citation	Continent	Specific region/country
[1]	Asia	Indonesia
[2]	Asia	China
[5]	Asia	Thailand
[11]	Asia	Pakistan
[17]	Asia	China
[20]	Asia	Indonesia
[25]	Asia	India
[26]	Asia	India
[43]	Asia	Japan
[45]	Asia	North Korea
[47]	Asia	Malaysia
[61]	Asia	South Korea
[64]	Asia	Taiwan
[83]	Asia	Thailand
[89]	Asia	Pakistan
[96]	Asia	Malaysia

Citation	Continent	Specific region/country
[74]	Africa	Cameroon
[118]	Africa	Not specified
[119]	Africa	Mozambique
[120]	Africa	Sub-Saharan Africa
[121]	Africa	Ghana, Kenya, Lesotho, Mozambique, Nigeria, Rwanda, Senegal, Tanzania and Uganda
[122]	Africa	Not specified
[123]	Africa	South Africa
[124]	Africa	South Africa
[128]	Africa	Nigeria
[129]	Africa	Ghana
[130]	Africa	Ethiopia
[131]	Africa	Morocco
[132]	Africa	Egypt
[133]	Africa	Tunisia

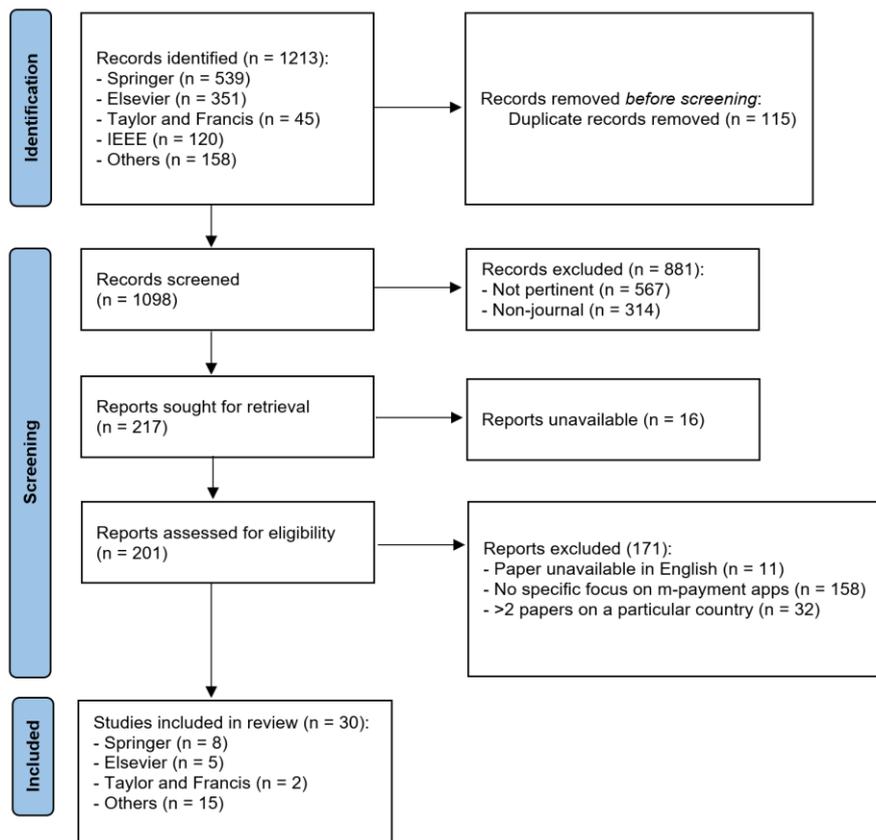


Fig. 1. Research flow diagram

The write up is organized as follows: the overview of existing m-payment apps and limitations of existing m-payment in section 3; and their general challenges from the lenses of stakeholders or members of the m-payment app ecosystem in section 4. A summarized look of the challenges is presented in section 5, followed by conclusion in section 6.

2. OVERVIEW OF MOBILE PAYMENT APPLICATIONS IN REGIONS OF LOW FINANCIAL INCLUSION

Discussion on existing mobile payment applications (m-payment apps) will be presented as they concern regions of low financial inclusion. M-payment apps selected for discussion were ones predominantly used

in the identified regions/countries based on dominance and volume of transactions. Financial inclusion or financial inclusiveness is the mechanism/process that facilitates easy access or reach, availability, and utilization of a range of appropriate financial services, such as credit, savings, payment/payment platforms, and products for risk management, for all members of an economy [26], [27]. The utilization here is widely known as adoption in the area of m-payment systems. In the course of retrieval of published materials for this work, it was observed that most works tilt toward adoption concerns. These concerns were predominantly about same set of countries/regions - Asia, Africa and very little on South America (which is why we excluded South America from our study). What is common to these regions is lack of financial inclusion. Financial inclusion per [26] and [27], are based on access to a number of financial services. This work focuses on m-payment apps because in recent times it has been a major tool in achieving financial inclusion. Access to all forms of financial services have been made easier with use of m-payment apps. With them, users open and operate bank accounts without ever needing to visit the bank offering the service. In Nigeria, for instance, a country of low financial inclusion, with your Bank Verification Number (BVN), you can open and operate a bank account without any face-to-face interaction with the bank. In reviewing the apps, attention was on identifying generic and peculiar issues users of m-payment applications are currently faced with in these regions. These issues were extracted from user reviews got from verified websites like www.capterra.com, google play store and journals. The m-payment app reviews are summarized in Table 2.

2.1 China

All over Asian countries, there is strong growth in digital payment adoption. China has emerged as the true mobile nation and a strong contender for largest contributor to the projected figure [28]. According to the report, in 2015, more purchases were made through mobile phones than computers by Chinese consumers. In 2016, 66 percent of digital purchases that equates to 450.3 billion dollars in mobile-based purchases were executed through mobile devices. M-payment users in China seem more subject to social influence than U.S.A., for instance. WeChat pay and Alipay have

become the primary and influential method of payment in China, even in rural areas [29] - a vast majority (92 percent) of Chinese mobile internet users (92 percent) choosing m-payment applications [28],[30]. Alipay launched its first mobile wallet in 2008 while WeChat came on board in 2013 and these two platforms have built two-thirds of a million formidable merchant networks [31],[32]. Of a market of over 1240 million active users in 2022. Wechat records 1305 million users [33]. Other m-payment apps like Union Mobile Pay, JD Bank Mobile Wallet and 1qianbao divide only 7 percent of the market share [34]. 75.8 percent of respondents in study in [35] use Alipay for hotel reservations. Wechat is a multipurpose app with currently about 1 million active users monthly [36]. It has certain functions including: messaging services, sharing of photos/videos and offers free video and voice call. Wechat is a good application with technical support and efficient feedback mechanism. However, some of the issues exists with Wechat app which can be summarized as follows: large storage capacity, cumbersome authentication, verification and security, compatibility with various operating systems and Problems with upgrading in general.

2.2 India and South East Asia

India is home of the highest ecommerce consumer rate growth in the world [37]. The big appetite of Indians for cross border shopping has largely influenced their use of mobile payment with over 82 percent in-app transactions equating to about \$16.8 billion mobile commerce market value. The mobile payment application largely used in India include Paytm, Google Pay, Amazon Pay, MobiKwik, etc.

Indonesia had the mobile commerce market share of \$7.1 billion as of 2020, OVO wallet and Go-Pay wallet are the leading mobile payment platforms with 69 percent and 62 percent usage respectively [37]. Debit cards is still the second most used payment method in Indonesia, however, Mobile payment is steadily taking the lead.

In Malaysia, The use of Touch N Go, PayPal, and GrabPay are all emerging. Similarly in Singapore, mobile payment platforms like FavePay, Google Pay, Apple Pay, Samsung Pay and PayPal are also emerging.

Table 2. Summary of review of existing m-payment Apps

Country	M-payment App	Pros	Cons
China	Alipay	Alipay has the QR code feature which works without NFC. Allows top up and and phone plans.	Non convenient for non-Chinese nationals [39]
China	WePay	It offers smart retailing technology [40]	
India	Paytm	Multifunctional payment app, used by majority to pay for products and services.	Layout of the app is not really convenient to some customers.
Indonesia	OVO Wallet	Most used in the Indonesian market. OVO e-wallet is easy to use, has a simple design and many features that can be used to upgrade the app [41].	Not many users find it easy to use.
Japan	PayPay	Most popular in Japan [42]. Quick, easy and very operational in sending and receiving money [43].	It has limited number of locations [42].
South Korea	Kakaopay	Most used mobile payment app in South Korea. Kakaopay is easy to use payment operations is because of its ease of use and simplicity 44],[38]. Kakaopay provides joint services support with Alipay to service 450 million Chinese and Korean m-payment consumers [45].	Generation of receipts for QR payment operations is problematic and takes a long time to complete [44].
Taiwan	LINEpay	Most used m-payment app in Taiwan (58%). [46]. LINEPay is a multifunctional application.	It is used only in Taiwan.
Malaysia	GrabPay	Most used in Malaysia with 13.3 million users	Foreign nationals in Malaysia still have issues accessing features in the app [47].
Thailand	TrueMoney	Most used m-payment app in Thailand. It has multiple layers of advance security and has 24/7 real-time monitoring [48].	It has limits on daily transactions and tourist have issues with the demands of certain documents not owned by non-citizens [49].
Vietnam	VTC Pay	VTC Pay's e-wallet has more than 3 million consumers and a million transactions recorded daily [50].	VTC Pay is limited by language versions [51].
Philippines	DragonPay	Most used in the Philippines [52]. Dragonpay platform is secured. It is Compatible with Mastercard and VISA cards; and digital banks in the Philippines. Can readily be integrated to e-commerce websites.	Slow performance of the app. Slow Customer service. Less than desirable user interface [53].
Zimbabwe	EcoCash	With Ecocash, users can deposit, withdraw and transfer money, pay various bills [54]. Controls 99.8% of the mobile	Users are restricted to sending a maximum of ZW \$10,000 per transaction. Users can not also exceed ZW \$280,000 per month [56].

Country	M-payment App	Pros	Cons
		money market in Zimbabwe [55].	
Liberia	VeriCash	Seeking to empower financial inclusion in emerging markets.	Mobile payment in Liberia is largely limited by lack of basic infrastructure, (including VeriCash [57]).
Nigeria	FairMoney	Smooth sign up process. Illustrative user interface [58]. No transactional charges. Easy access to loans.	Rigorous login procedure. Privacy concerns where user is required to grant Fairmoney access to his contact list [58].
Columbia	DaviPlata, Movii	DaviPlata and Movii is currently used in Columbia with a record of about 33% usage and 3 million user respectively.	Poor user support system. App tends to crash often. Users complain of repeated failed registration and login attempts.

In Thailand, TrueMoney is the leading payment method, other mobile payment platforms like PromptPay and Rabbit LINE Pay are emerging and the mobile commerce market size as of 2020 is \$13.6 billion.

2.3 Other Regions in Asia

In Japan, as of 2020, credit card was still the leading payment method in Japan, they had 70.6 percent mobile wallet penetration that same year and an expected mobile wallet penetration of 98.6 in 2025. The most popular payment ewallets in Japan are PayPay and Rakuten Pay [37][28]. However, they have about \$36.6 billion mobile commerce market size.

In South Korea KakaoPay and SamsungPay, are now the preferred payment method with 35 percent of their population currently using the platforms and mobile commerce market size of 2.8 billion dollars. However, credit card is still the most preferred method of payment in Taiwan, seconded by pay-on-pickup, only 10.4 percent engage the use of LINEPay for payment.

2.4 Africa

Mobile payment is also being embraced in African countries; 84 percent of mobile payment users in Kenya, 60 percent in Nigeria, 21 percent in South Africa and 9 percent in Morocco. In Nigeria, the most populous nation in Africa, the race has been between bank apps and fintech apps. Nigerians are embracing the fintech apps in

numbers, evident by the number of downloads. No bank app in Nigeria has grossed the number of downloads as either of Fairmoney and Opay fintech apps. Fairmoney stands out primarily for easy access to loan that it offers users.

3. CHALLENGES

As shown in the previous section, concerns with m-payment apps may seem purely user centric. However, to really achieve financial inclusion with m- payment as a tool, we may need to look at the broader picture. Which is, that there are other players involved, not just the users. Stakeholders of mobile payment platforms include user, commercial banks, payment gateway, developer, regulators (the government in some cases and regulatory banks) [58], [59] and intermediaries [60]. It is presented in [61] as a triadic ecosystem involving consumers, online vendors and regulators. Captured in similar words, usage or customer loyalty in mobile telecommunications as a whole has long been deemed an outcome of triadic interactions of users, companies/vendors and government [62][63]. There are interdependent activities carried out among stakeholders in the mobile payment ecosystem; stakeholders like the government, communication technology and banking [64]. Dennehy and Sammon [65] put the stakeholders to be financial institutions, mobile network operators (MNO's), integration partners, merchants, consumers and regulators. The stakeholders can also be visualized from three platforms [66]: Sponsor level (Mobile device makers, payment terminal

makers, software company, MNOs, credit card companies and banks); Platform level (Mobile payment platform); and User level (Consumers and merchants). In aggregating all these positions on the stakeholders involved in m-payment apps, we consider users/customers, regulators/ government and merchants in our discussion of challenges with m-payment apps.

3.1 Challenges from Users' Perspective

Adoption of payments using mobile devices often demand the user/customer's willingness to learn [67]. This positively and significantly affects perceived security and perceived trust [59]. This perceived security and perceived trust in turn influence users' perceived usefulness (PU) which has highest significance on behaviour intention or intention to use [29]. Ubiquity is added to that list by [68] as a statistically significant positive contributor to perception of ease of use, perception of usefulness and the intention to perennial usage of mobile payment service like electronic wallets. Issues with m-payment from users' viewpoint can be either ones impacting directly or indirectly user adoption. In [69] most influential direct effect on m-payment adoption is consumer innovativeness, perceived convenience and perceived behavior. On the other end, perceived pleasure with subjective norms was found to possess an indirect effect on the adoption of m-payment with convenience as mediation [128]. The survival of m-payment systems is majorly influenced by user satisfaction, effort and performance expectancy [70], and how compatible the technical features are with task demands [71]. Quite a number of literature exist that have evaluated user adoption of m-payment according to some theories: unified theory of acceptance and use of technology (UTAUT) model, the information systems success (ISS) and task-technology fit (TTF) model. ISS captures system quality, information quality, the quality of service and user satisfaction. Twitter analytics of popular hashtags and @ occurrence of 'digital payments' established factors which propel user satisfaction to include: usefulness, responsiveness, responsiveness, information privacy, credibility and tangibility [72]. TTF considers task characteristics, technology characteristics and task-technology fit. UTAUT involves social influence, intention to

use, performance expectancy, effort expectancy and facilitating conditions. Consequently, we discuss user centric challenges as follows:

3.1.1 Internet Experience (IE)

Mobile payment has become an easy way to carry out financial transactions because of widening popularity of mobile devices and the coming-of-age of associated technologies [73],[130]. Users' familiarity with use of computers and the internet for financial activities greatly impacts their intention to use m-payment apps. Technology Acceptance Model and Innovation Diffusion Theory were combined in [73] to discovering that internet experience and the adoption of mobile payment apps have a relationship, but with perceived usefulness, privacy concern, compatibility, risk, and perceived ease of use as mediating effect.

3.1.2 Socio-economic Factors (SF)

In Cameroon, for instance, a developing country in West Africa, socio-economic factors like standard of living, level of education, age and mobile phone ownership contrastingly affect both the adoption and use of mobile money services in Cameroon [74]. Expanding variety of financial services and financial education were proposed as way forward. People more advanced in age tend to approach m-payment app with caution, while people of younger demographic tend to readily embrace it as they do technology generally.

3.1.3 Perceived Trust (PT)

The discussion of challenges with mobile payment platforms is principally couched in the concept of trust. In fact, the definition of trust in the domain of mobile payment presented in [29] completely captures the main perspectives of security viz confidentiality, authentication, integrity and non-repudiation. This explains why trust is dubbed an essential matter in m-payment and that cultivating trust in the third-party platform has become critical in the continuity of m-payment services [75].

Perceived trust is the user's willingness to be vulnerable [76]. People in this category may have no prior experience with the Internet and only a rudimentary understanding of how it operates. Therefore, m-payment app are a big

step into the unknown, mainly when no one can guide them or explain the details [77]. In [78], trust is one of the four user-centered constructs observed to have significant positive impact on m-payment adoption intention in India, but its impact is indirect [79]. Related but not specific to mobile, trust weighed among top four factors driving adoption of cashless payment in Malaysia [80]. A survey done in Australia found perceived information quality, perceived system quality [81], and perceived service quality to be instigators of initial trust [82].

Connection between intention to use and actual adoption of m-payment app can be aided by brand equity, quality of service, public policy, service innovativeness and switching costs [64],[121]. This shows two things: that intention to use is not necessarily same as actual usage, and that it is the business ecosystem that impacts the transition of intention to behaviour. Though it is the users/customers that actually make the demand for m-payment apps, it is actually the value-added services available on m-payment platforms that drive user demand for m-payment platforms. This is why m-payment app adoption increases whenever there is improvement in effectiveness and efficiency of services on m-payment apps [1].

In a Bangkok study, results showed that perceived risk impacts negatively on intention of millennials to use m-payment for mobile shopping [83]. As mediation test reveals, attitude mediates the connection between perceived time risk and intention to use m-payment. To put this in context, perceived risk negatively affects perceived trust by millennials in online marketing platforms [84]. Perceived ease of use is another mediation between perceived time risk and intention to use m-payment [68]. It is therefore pertinent that business practitioners design simpler systems under the most bearable transaction time to engender productive attitude towards m-payment [83],[131].

3.1.4 Perceived Risk (PR)

Perceived risk can be divided into perceived financial risk and perceived information risk [85], as well as perceived performance risk [43]. Perceived financial risk is defined as users' beliefs, judgements, behaviors and

feelings of the risk characteristics of an m-payment app [86]. Perceived performance risk is the degree to which a user considers an m-payment app performing contrary to what he needs. Perceived performance risk or performance expectancy, m-payment app implies the extent to which a user believes that available on the mobile payment system will facilitate their performance of financial tasks and enhance their overall performance [87]. The online survey of 295 respondents in [85] revealed that perceived risk as a whole has a positive impact on both use intention and perceived usefulness. Perceived risk is also a concern for some specific uses of mobile payment. Also, findings in [67] indicate that wider adoption of mobile in-store payments is hampered by perceived security and privacy risks, as well as perceived risks of reliance on a mobile phone and lack of perceived relative advantage to other payment options. The findings in [43] indicated performance risks imply safe, secured, reliable, and fast mobile payment environment to low, medium and high intention users, valued ahead of financial risk [43].

3.1.5 Intention to Use (IU)

Results of the study in [23] indicated that ease of use, relative advantage, visibility and perceived security positively influence the individual's intention to use m-payment services. Intention to use in the future, intention to recommend mobile payment services or continuance intention, can be viewed as post-adoption metamorphosis of intention to use. The later can be seen as the mirror perspective of continuance intention. Using the push-pull-mooring framework, critical antecedents of switching intention of m-payment platform users in Taiwan were investigated in [88]. The most pivotal push effect making m-payment platform users to switch is user regret brought on by dissatisfaction with system quality (mainly system stability and visual attractiveness) and information quality. While inertia related to uncertainty cost had most negative association with user switching intention.

3.1.6 Technology and Innovativeness (TI)

Since performance expectancy have significant impact on value, it follows that functionality of technology significantly predicts perceived value [89]. To a large extent, the experience of users with (and interest in) computers and

the internet influences their propensity to use mobile payment apps [73]. Non-familiarity with technology can dissuade prospective users, however beneficial the platform may be. To the demographic already used to technology gadgets, innovativeness becomes a factor in retaining intention to use [90]. Users usually associate innovativeness of a mobile payment app with added performance. Innovativeness in the form of promotional activities were found to be a strong driver of use of m-payment apps by young generation [91].

3.1.7 Perceived Ease of Use (PEOU)

Ease of use as the extent to which customer's use of m-payment system (services) is perceived as easy or effortless [92]. PEOU has been observed to have positive and weighty impact on consumers' desire to use mobile payment [85]. In fact, a study in Tunisia found perceived ease of use and perceived usefulness to foster adoption of m-payment apps, more influential than even perceived security and perceived trust [133].

3.1.8 Age and Income (A&I)

Age and income affect intention to use m-payment apps with perceived expectation, perceived cost and perceived risk [93],[94]; all except the later positively moderate intention to use. Also, younger adults in better earning homes, with better exposure to education and mobile devices more probable to adopt and use mobile payment [95]. Good income represents being able to afford a mobile device [132]. Age mostly represents interest in technology, and adaptability to it, which is highly influenced by perceived compatibility.

3.1.9 Perceived Compatibility (PC)

Perceived Compatibility is extent to which a new technology converges with the lifestyle, principles and needs of the prospective adopter. Perceived compatibility is one of the mobile-based predictors of using m-payment technology, especially in budding digital economy. In a study in Malaysia, perceived compatibility was observed to have a strong connection with intention to use the mobile payment for mobile network operators' services, with perceived usefulness and perceived ease of use as mediation [96]. To support this mediation, in a Tanzanian study [97], compatibility was deemed to determine perceived usefulness of m-payment apps [85]. Following what perceived compatibility is defined as, adoption of an m-payment app

can be fostered if the it addresses an adopter's needs (perceived usefulness or value e.g. quick access and reward for loyalty [98]) and/or his ease (perceived ease of use). Both put together represent effort expectancy, which is the degree of comfort and usability that users experience when using an m-payment app [77], [99], [100].

3.1.10 Social Influence (SI)

As m-payment steadies in its growth phase, having progressed from the introduction phase, consideration of factors influencing adoption other than technology becomes pertinent - social, for example [64]. Social influence is defined as performing certain actions with the views of others in mind [101]. A significant impact of social influence on behavioral intention was observed in [89], [70] to make consumers more willing to adopt m-payment if friends and family are using this payment method. Same in Bangladesh [102], and in Thailand [103]. Awareness of neighbors' use of cashless money transaction has a substantial positive effect adoption [95]. However, behavioural intention of Millennials in Indonesia were found to be affected minimally by social influence, as they were more enamored by infrastructure that can help their daily needs [70]. In Bangladesh, social influence was also found to affect intention to adopt mobile banking, but with gender as mediation [104]. As further contrast, respondents in sultanate of Oman (in the Middle East) indicated that publicizing review ratings of service providers ease users' reluctance to use mobile payment application.

3.2 Challenges from Regulator's Perspective

This is the viewpoint that captures policy, regulation and standardization. Financial inclusion or any tool that fosters it requires control, supervision and enforcement of some sort, with legal or judicial backing [105], [106]. Government regulations is one of the contextual variables that affect mobile payment adoption [25]. Many central banks and other policymakers want to review and possibly strengthen regulatory frameworks for mobile money, for instance. The orthodox method of regulating m-payment apps does not offer sufficient guidance for these policymakers. Reason being that normally

payment systems operate through banks, which work under tested prudent regulation [107]. So when a payment protocol can thrive without banks, for instance the fintech m-payment apps, as presented in [108], they pose challenges to such existing regulatory frameworks. In some cases, the existing regulatory frameworks are ill-equipped to handle such challenges, especially security challenges [108].

With the expansion of Fintech mobile payment platform has come risks. Xia et al [109] posit that the impact of those risks can be reduced by helping mobile payment apps understand regulatory policies and reduce platforms' operational risks, without impeding users from understanding the risks of mobile payments. From global experience so far, regulators should adopt a functional approach to regulating m-payments instead of an established or institutional approach [110], [118]. There is need for governments to scale up their reform and upgrade the regulatory framework to make room for development of payment systems [111]. Apart from aforementioned roles of regulators, we have others:

3.2.1 Enlightenment on Demonetization Policy (EDP)

Users need to be informed not just of the roll out of demonetization policies but also of the all-encompassing benefits. Otherwise, users of financial services are likely to swing with whatever conspiracy theories they can mutter, extending the distrust they have in some aspect of the system to demonetization policies which m-payment apps are to service. Even when such sentiments are not an issue, people still need to have government say on m-payment for such to earn their trust. The study in [112] investigated user's behavior toward m-payment apps in India, pivoted on motivational model and consciousness of demonetization policy in place. What was observed was a correlation between the motivation model adopted in the work and consciousness about demonetization policy in m-payment app usage. Specifically, a positive correlation exists between extrinsic motivation and propensity to use m-payment apps [124]; and between awareness about cashless policies and behavioral likelihood to use m-payment app. This supports the findings in a Tanzanian study that m-payment knowledge predicts PEOU [97], and PEOU determines m-

payment use intention [96]. What is proven here is the significance of heightening consciousness of the no-cash or cashless policy as a stimulating factor of users' tendency to use M-payment services.

3.2.2 Managing Effect on the Financial Ecosystem (EFE)

As noted in [113], mobile payments are constantly metamorphosing because they can step up access to monetary services, particularly in countries of low financial inclusion. Such transformations can disturb the monetary services ecosystem, prompting varied response by regulators. These regulatory reactions many a times impact markedly on the fortune of such innovative services, in a way that truncates such innovative services.

3.2.3 Interest Groups Effect (IGE)

Pressure groups, public opinions or the media always seek to have a say on policies, ranging from lobbying to less ethical methods like blackmail. Policies regarding m-payment is no exception. Conflicts between interest groups and the regulatory measures/policies in government can be triggered by rapid technological innovations witnessed over technological innovation. Using Korean regulatory sandbox, Lee and Seo [114] explained why the mechanism of interest groups influence inter-ministerial control/regulatory policy negotiations within governments. Way out can be approached from some configurations viz: mutual cooperation between government and interest groups, active acceptance for new policies and passive acceptance for new policies.

3.3 Challenges from Merchants' Perspective

The business ecosystem set up determine merchants' adoption decision [115]. Although merchants play a important role in the m-payment ecosystem, there is a shortage of cognizance into merchant behavior, and how they interact with other stakeholders/actors in the m-payment ecosystem [115]. It is necessary to understand determinants of merchants' choice to use mobile payments in order to guide the provider companies in modulating their own marketing strategies to avoid things that may dissuade merchants from the mobile payment market [116]. The study in [116] put perceived risk and perceived

ease of use as having no significant positive impact on merchants' decision to offer mobile payment method. On the other hand, compatibility with customers' needs and perceived usefulness have positive impact on merchants' acceptance of mobile payment systems [129]. When merchant adoption is not triggered, mass use of m-payment apps or e-wallets remains out of reach [111]. A further look into m-payment apps from a merchant's point of view shows that decreasing payment processing time and fees, enhanced payment security features and convenience are some of the drivers of merchants' intention to adopt m-payment apps, while cost of investment, complexity and technological incompatibility are some of the reasons dissuading merchants from doing so [117].

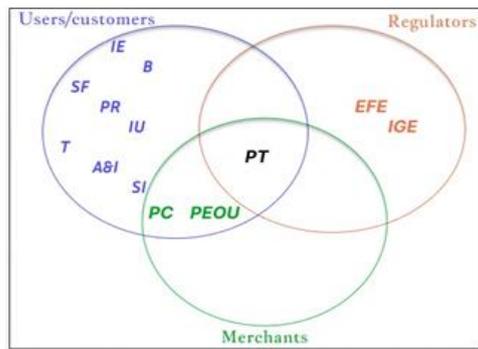


Fig. 2. Summary of Multiple perspective challenges with m-payment apps

4. SUMMARY OF THE CHALLENGES

As shown in Fig. 2, the issues affecting adoption for the different stakeholders of m-payment apps are very similar for some stakeholders (e.g. between users and merchants) and mostly divergent (or very thinly similar) for others (e.g. between users and regulators; and between merchants and regulators). Adoption concerns for users and merchants are related in the areas of perceived trust (PT), perceived compatibility (PC) and perceived ease of use (PEOU). Other than that, user centric concerns are predominantly different from those of merchants. Also observed in the course of our study is that perceived trust is the only overlapping concern between the three stakeholders (or members of m-payment app ecosystem) considered. Enlightenment on demonetization policy (EDP) directly maps into perceived trust (PT), because its main objective is to ease users' apprehension,

thus promoting perception of trust in m-payment apps.

5. CONCLUSION

The work presents understanding of m-payment app adoption concerns from multiple perspectives of users/customers, regulators/government and merchants. The discoveries in the work have underline this need to consider the perspectives of members of the m-payment apps ecosystem, asides users or customers. Interestingly, the challenges of m-payment apps from users' perspective, as myriad as they are, were found to only very marginally overlap with those of regulators. Only regulators' task of enlightenment of users/customer of about demonetization policies mirrors one of users' concerns, perceived trust. On the other hand, user centric challenges are slightly similar to what motivates adoption by merchants, except in concerns bothering on perceived risk and perceived ease of use concerns. The challenges of regulators as regards m-payment apps are quite divergent from those of merchants. It is only with the introduction of users as mediation are their concerns connected. In all, the implication of this divergence or quasi-divergence of concerns of the different m-payment app stakeholders, is that a great deal of actionable information for harnessing the potentials of m-payment apps is gained by this multi-perspective review.

Further review can be done on other members of the m-payment ecosystem like integration partners. Integration partners are seen as technology providers that act as a trusted intermediary between banks and MNO's and mobiledevice producers.

COMPETING INTERESTS

Authors have declared that no competing interest exist.

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