

Factors Influencing Diffusion of Innovation of Mobile Payments

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Abstract

The diffusion of innovation theory is a hypothesis outlining how new technological and other advancements spread throughout societies and cultures, from introduction to wider-adoption. The diffusion of innovations theory seeks to explain how and why new ideas and practices are adopted, with timelines potentially spread out over long periods. The way in which innovations are communicated to different parts of society and the subjective opinions associated with the innovations are important factors in how quickly diffusion or spreading occurs.

The genesis of mobile payments draws from the history of introduction of technology to the banking system by use of electronic channels for delivery of banking products. It was the culmination of ICT and computers to deliver the banking services to the customers. Therefore much of the literature on the subject available for review is on the customer acceptance of the electronic banking technology.

This study examine the various factors influencing the diffusion of innovation of mobile payments and through various approaches i.e. technology adoption model along with innovation diffusion theory, Innovation Resistance Theory, Technological Environmental Organization on the adoption of mobile payments, certain qualitative studies, Global report(s) , case studies and longitudinal studies. This study studies the social/ external factors that influence the process of adoption at the unit level by influencing the TAM factors of perceived usefulness and perceived ease of use. The main contribution of this paper is to examine the various factors that influence the diffusion process. Banks /other payment system operators should focus on increasing the usage of digital banking by studying the factors and making necessary adjustments to the process/product.

Keywords: Mobile payments, Diffusion of Mobile Payments, Digital payments, Factors influencing

Introduction

The advancement of communication technology through convergence of (i) 3G and 4G channels and (ii) availability of mobile handsets in affordable costs which were compatible with 4G and 3G delivery channels led to the emergence of mobile banking technology. This was revolutionary as there no reliance on the wired / wireless (placedependent) broadband channel pegged to a computer. This led to the evolution of anytime and anywhere banking where the efficient mobile handsets replaced the computers for access to the banking services and the 3G/4G data services provided through telecom services served as the delivery channel

In a global study (Paul van der Boor, Innovation and Diffusion from South to North: Evidence from Mobile Banking), a study of 138 firm entries by 93 different firms in 76 different countries was studied; the list included the first mobile banking product that was launched in 1997 up to May 2012. It was observed that most of the services in the sample emerged in non-OECD countries and diffused primarily to developed regions. Market demand appears to play an important role on innovation and firm entry. There was a negative correlation, that is, the less the fraction of populations with accounts in formal institutions, the greater the number of services in mobile banking service providers. The study observed that higher latent demand in developing countries made these novel financial products diffuse rapidly and in some cases leapfrog technologies that were prevalent in the developed countries such as ATM cards and conventional bank accounts.

The literature review on this topic that has been attempted in this article, therefore draws from studies/academic articles that have mostly emerged in the developing economies in Asia and Africa along with a few studies in Europe.

The diffusion of innovation theory is a hypothesis outlining how new technological and other advancements spread throughout societies and cultures, from introduction to wider-adoption. The diffusion of innovations theory seeks to explain how and why new ideas and practices are adopted, with timelines potentially spread out over long periods. The way in which innovations are communicated to different parts of society and the subjective opinions associated with the innovations are important factors in how quickly diffusion or spreading occurs. Thus for effective diffusion of the innovation of mobile payments, there is a requirement of having sufficient and increasing presence of various stakeholders on the platform, a smooth and comfortable experience and significant benefits to the stakeholders both on the sender and receiver side.

Overview of Literature

In order to explore the subject and factors impacting diffusion of innovation of mobile payments, a study of the literature on this topic was undertaken.

Traditional growth theory has assumed that innovations are first introduced in advanced countries (North) and later diffuse through imitation to the developing world (South) (see e.g., Krugman [1979], Grossman and Helpman [1991]). With the advent of digital technology, the literature reviewed suggest that the innovation could emerge in developing countries and diffuse to the developed countries. This was examined in the paper Innovation and Diffusion from South to North: Evidence from Mobile Banking (Paul van der Boor, Innovation and Diffusion from South to North: Evidence

from Mobile Banking, 2013). The study examined data set on the history of mobile banking worldwide. The data include all firm entry into mobile banking since the beginning of the industry. It used data on firm entry and firm growth, tracking subscriber numbers and total volume transacted in dollars over time as well as firm histories and service deployments. This led to a rich dataset that is comprised of 138 firm entries by 93 different firms in 76 different countries. It was observed that at least 13 of the 16 innovations that originated in the developing world have already diffused to one or more OECD countries. Not only did most of the services in the sample emerge in non-OECD countries, they diffused primarily to developing regions. Market demand appears to play an important role on innovation and firm entry. There was a negative correlation with the access of the population to formal banking channels, the less the fraction of populations with accounts in formal institutions, the greater the number of services in mobile banking service providers.

In terms of Rogers Diffusion of Innovation Theory; an innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption; innovation presents an individual or organization with a new alternative(s) or new means of solving problems. Whether new alternatives are superior is not precisely known by problem solvers. Thus people seek new information. Information about new ideas is exchanged through a process of convergence involving interpersonal networks. Thus, diffusion of innovations is a social process that communicates perceived information about a new idea; it produces an alteration in the structure and function of a social system, producing social consequences.

Diffusion has four elements: (1) an innovation that is perceived as new, (2) communication channels, (3) time, and (4) a social system (members jointly solving to accomplish a common goal).

Time enters the diffusion process in three ways: (1) innovation-decision process, (2) innovativeness, and (3) rate of the innovation's adoption. The innovation-decision process is an information-seeking and information-processing activity that motivates an individual to reduce uncertainty about the (dis)advantages of the innovation. There are five steps in the process: (1) knowledge for an adoption/rejection/implementation decision; (2) persuasion to form an attitude, (3) decision, (4) implementation, and (5) confirmation (reinforcement or rejection).

Time enters the diffusion process in three ways: (1) innovation-decision process, (2) innovativeness, and (3) rate of the innovation's adoption.

Rates of adoption of an innovation depend on (and can be predicted by) how its characteristics are perceived in terms of **relative advantage, compatibility, complexity, trialability, and observability**. The diffusion effect is the increasing, cumulative pressure from interpersonal networks to adopt (or reject) an innovation.

The available literature on mobile payments were examined on these factors that could have a possible impact of the process.

Impact of Relative Advantage:

The relative advantage of a new innovation (idea/product) is generally measured in economic terms but could also be gauged in terms of immediacy of service, bouquet of services , social prestige, convenience and satisfaction which are comparable to factors used in other models like TAM (through perceived usefulness and perceived ease of use).

In one of the earliest studies on the impact of relative advantage of mobile payments conducted in Saudi Arabia (SohailM., 2012),Pakistan (Mazhar Abbas, 2019), comparative study in India and Thailand (Sirion Chaipoopirutana, 2010), Russia (Zhenquan2, Factors Influencing the Diffusion and Acceptance of Innovation in the Payment Technology Area., 2018) , relative advantage had a significant influence on continued usage/ adoption/diffusion of mobile payment services. The studies conducted with respect to Mobile payments (NFC) in Thailand and Korea (Toyyeba Longyara1, Oct 2015) confirm the same observation. The adoption of mobile payment services (NFC) in Korea and Thailand (Toyyeba Longyara1, Oct 2015) confirmed the findings as well. A similar study conducted in Korea (Eunyoung Lee, 2020)confirmed the findings that relative advantage (via perceived usefulness and perceived risk was a significant factor in diffusion of innovation of mobile payments

In another *qualitative study* in Indonesia(Efendi, Motivation to Use M-payment in Shopping Centre: A Qualitative Inquiry, 2020)("Priyanka Jain, 2019) it was observed that participants are motivated to use Mobile payments because of convenience, sales promotion, convergence and keeping up with the ends.

The literature review revealed two *longitudinal studies*; one in Brazil(Fernanda Malaquias, 2018)that observed that mobile banking adoption increased over a period the period of time. The perception of relative advantage (ease of use, social influence etc.) had also registered an increased. Some determinants changed over the period of time (trustfactor). A study on consumer acceptance of mobile banking over a period of time (case study on Wechat)(Huang, 2019) is related to perceived risk, perceived usefulness and positive emotion. The positive emotion in this case was the availability of red envelopes in electronic mode on the Wechat platform which simulated the traditional used by in the Chinese culture for gifting money (placed in red envelopes) to friends and relatives during festive occasions. This was consistent with their traditions. This also forms part of the compatibility factor. In the longitudinal study, it was observed that impact of positive emotion was higher during the stage of market growth rather than during the introduction stage.

In another study comparing the Alipay in China and the Swish in Sweden, (He, 2020)it was observed that the relative advantage (vide satisfaction via perceived ease of use) had a positive impact on the diffusion/ continued usage of mobile payments. Alipay was considered to be comparatively better on account of presence of a large number of merchants. This convergence of a large market place to the payment app considered to be a win-win factor for the diffusion process.

It was observed that the factor of relative advantage was a significant factor in all the studies in all the jurisdictions through the Diffusion of Innovation model as well as in case studies. It was a significant factor in cross sectional as well as in longitudinal study.

a) Complexity :

In terms of the Diffusion of Innovation Theory, complexity has a negative impact of the adoption of an innovation. This was confirmed by studies in Diffusion of mobile banking in Pakistan (Mazhar Abbas, 2019), Diffusion of innovation in Asia: a study of Internet banking in Thailand and India (Sirion Chaipoopirutana, 2010), Diffusion of Innovation in Asian: A Study of Mobile NFC (Near Field Communication) Payment in Korea and Thailand (Toyyeba Longyara1, Oct 2015) and in Germany in article Nothing but Cash? Mobile Payment Acceptance in Germany (Soeren Baersch M. S., 2020).

In Germany, it was observed that the inexperienced users had a negative association with the adoption process on account of compatibility. However, there was no impact of complexity in the experienced users.

In the studies conducted in Saudi Arabia (SohailM., 2012), Complexity is found to have an insignificant effect on mobile banking adoption, This result is unexpected and contradictory to findings of some prior studies. It was inferred that since majority, 72.7%, of the sample respondents of this study are young (between ages of 18 and 25), it is possible that they can learn mobile banking easily; and thus the complexity has no impact on their decision whether they adopt mobile banking or not. Age and experience had a moderating factor on the negative association with the adoption process.

In the study conducted in Korea (Toyyeba Longyara1, Oct 2015), the findings suggested the complexity of mobile banking is not a barrier. It reflects the reality existing in Korea society. The customers using mobile banking, perceived value of advantage, compatibility and benefits more than complexity.

It was observed that complexity largely had a negative influence on the adoption process. However it was not a barrier in Saudi Arabia (sample group was of youngsters with a decent income), in Korea (where technology is part of the social culture), for experienced users in Germany.

Thus it is observed that while complexity had a negative influence on the innovation process; certain moderation was observed through other factors like, age, experience and social influence.

c) Compatibility

Rogers (1962) was the first one to introduce and define the term compatibility in his Innovation Diffusion Theory. "Compatibility assesses the extent of congruence between a new technology and various aspects of the individual and the situation in which the technology will be utilized" (Karahanna et al., 2006, p. 782).

This is an important factor of the model and has been investigated and established in various studies. It has a positive influence on the adoption process.

The (SohailM., 2012) studies conducted in Saudi Arabia have shown that perceived compatibility of an innovation has a positive influence on the adoption of mobile banking. This implies that mobile banking service fits well in the manner customers manage their finances, is suitable to their working and lifestyle, and therefore, they like to adopt new innovations.

When customers or prospective customers perceive that using mobile banking is completely compatible with their current ways of banking and it fits well with the way they like to do banking, they tend to adopt it.

A study on consumer acceptance of mobile banking over a period of time (case study on We chat) (Huang, 2019) is related to perceived risk, perceived usefulness and positive emotion. The positive emotion in this case was the availability of red envelopes in electronic mode on the Wechat platform which simulated the traditional used by in the Chinese culture for gifting money (placed in red envelopes) to friends and relatives during festive occasions. This was consistent with their traditions. This also forms part of the compatibility factor. In the longitudinal study, it was observed that impact of positive emotion was higher during the stage of market growth rather than during the introduction stage.

A study in Pakistan on Diffusion of Mobile Banking in Pakistan (Mazhar Abbas, 2019), observed that consumers always wanted to learn about novelty and excitement from novel product adoption, thus establishing that compatibility to the learning of innovation had a significant influence on diffusion of mobile payments. Another study in Diffusion of innovation in Asia: a study of Internet banking in

Thailand and India (Sirion Chaipoo Pirutana, 2010) observed that compatibility have moderate positive correlation among the Indian customers, whereas Compatibility has high positive correlation only among Thai customers.

In the study Examining The Role Of Usability, Compatibility And Social Influence In Mobile Banking Adoption In Indonesia (Hotna Marina Sitorus, 2019) Compatibility is found to have a significant positive influence on perceived usefulness .and on the intention to continue using mobile banking. This suggests that when customers find mobile banking to be compatible with their values, habits or needs, they are likely to believe it to be useful, and will intend to use it continually.

In the case study on Drivers of Mobile Payment Acceptance in China:

An Empirical Investigation” (Wei-Chuan Chen, 2019), the study finds that users in China are more willing to use mobile payment (compatibility) when it is consistent with their living habits, In addition, as mobile payment is more convenient and efficient than traditional payment methods, people in China give priority to using mobile payment services.

In the article Analysis of the Development Process of Payment Methods and Mobile Payment Technology Diffusion Trend in China (Yingying Li, 2020), it is observed that compatibility had a significantly greater impact on the adoption process than mass media i.e. The payment products’ internal factors of the interpersonal reputation effect on diffusion are significantly stronger than those of the mass media.

In the article , M-Pesa: A Case Study of the Critical Early Adopters' Role in the Rapid Adoption of Mobile Money Banking in Kenya (Benjamin Ngug, 2010) the findings suggest that compatibility of the payment product innovation of the mobile phone technology was a big push for adoption of the payment product; It observed that for the communication technologies like such adoption requires a set of adopters who have leadership in the society; they serve to penetrate the majority in the receiving market; The second issue of penetrating illiterate to semi illiterate populations was using simple but reliable technology to push it throughout the population. This ensures that knowledge will

be passed from one group to the other making it easier to adopt and use. A third strategy is to look for pre-existing structures (mobile phones)that connect to a new innovation People fear change hence a technology that connects with existing structures and social systems will have minimal resistance to change.

Thus, it may be observed that the studies in various jurisdictions and across various cultures reported a positive influence when the innovation was compatible with the users existing belief systems/ culture and society.

d) Observability / perceived status benefits.

Observability is the **degree in which the innovation or its results can be seen by others likely to adopt it**. If potential adopters are unaware of the innovation or do not see it being used by their peers, they are less likely to adopt it themselves.

The diffusion of Innovation Theory lays great importance on the early adopters who are seen as influencers in the diffusion process. The same was examined in the literature available on the subject.

According to studies conducted Saudi Arabia, (SohailM., 2012), Observability had a positive impact on adoption of mobile payments. In the mobile banking context, it is the ability to see the beneficial results like immediate access to transactions anytime and anywhere. From the customers' perspective, mobile banking offers a very convenient and effective way to manage one's financial transactions as it is easily accessible around the clock.

A study in Pakistan on Diffusion Of Mobile Banking (Mazhar Abbas, 2019)hypothesized that socialinfluence significantly and positively influencedthe mobile banking adoption.

In a study on Impact of Diffusion of Innovation on Cashless Transaction Adoption and Continued Usage inTarawa State it was observed that Media influence and Social influence emerged as positive factors in the adoption of cashless transaction, then DOI (Diffusion of Innovation) helps in broadening the user's knowledge on the importance of cashless transactions. The result of this research work presents a confirmation of the appropriateness of the integration of TAM with DOI for explaining individual behaviour thereby provides support for the links added to represent the impact of DOI on attitude and behavioural intention in the adoption and continued usage of cashless transactions. In another article on GOING CASHLESS: ADOPTION OF MOBILE BANKING IN NIGERIA (Odumeru, 2013)has shown empirically that age, educational qualification, relative advantage, complexity, compatibility, observability are important determinants of the adoption of mobile banking.

The study on examining the role of usability, compatibility and social influence in mobile banking adoption in Indonesia (Hotna Marina Sitorus, 2019) observed that Social influence a significant positive influence on the intention to continue using mobile. Although the magnitude of the influence is small, this finding suggests that the influence of other people in bank customers' social environment will shape their intention to use mobile banking continually. Social influence is also found to have a significant positive influence on compatibility confirming our suggestion that

compatibility with an individual's values, needs and lifestyle is influenced by their social network. The magnitude of the effect implies that the social environment plays a substantial role in shaping customers' belief in the compatibility of mobile banking, although this finding might be impacted by the fact that the majority of our respondents were female.

Interestingly a study on Drivers of Mobile Payment Acceptance in China: An Empirical Investigation (Wei-Chuan Chen, 2019). The results of this study show that social influence does not have a significant impact on Chinese users' adoption of mobile payment. As this result is inconsistent with previous studies, it is suggested that further discussion can be conducted regarding whether social influence has a significant impact on users in different demographics variables (e.g., gender, education, usage experience, etc.) adopting mobile payment service. Another study on China i.e. Analysis of the Development Process of Payment Methods and Mobile Payment Technology Diffusion Trend in China concluded that the payment products' internal factors of the interpersonal reputation effect on diffusion are significantly stronger than those of the mass media.

A study in Korea on Understanding and Predicting Behavioural Intention to Adopt Mobile Banking: The Korean Experience (Hong, 2019) establishes that consumer's attitude toward mobile banking is significantly positively influenced by perceived herd behaviour (i.e., perceived social pressure to follow the fad about mobile banking use)

While almost all papers have observed that the Observability was a strong influence on the diffusion process; it was observed that in China diffusion was driven through compatibility and not by the observability. Convenience and converge of merchants and a strong technological culture in society had driven the diffusion process. Whereas in Indonesia it was found that observability played a substantial role in shaping customers' belief in the compatibility of mobile banking. Thus we may infer that observability had a positive influence on compatibility which fuelled the diffusion process.

Trialability:

Trialability is the **degree to which an innovation may be experimented with on a limited basis**. Because new innovations require investing time, energy and resources, innovations that can be tried before being fully implemented are more readily adopted.

The studies conducted in Saudi Arabia (SohailM., 2012) reveal that trialability did not have a insignificant effect on mobile banking adoption. One explanation was that consumers may have trust in mobile banking, find it useful, and consider it safe and less risky. Hence; they think that there is no need to try it out. It is also to be kept in mind that the sample of respondents was in the age group of 18-25, technologically savvy and comfortable with the banking operations.

In a study Diffusion of innovation in Asia: a study of Internet banking in Thailand and Indian (Sirion Chaipoopirutana, 2010) Trialability, was found to have moderate positive correlation among the Indian customers as well as among the Thai customers. A study in Nigeria GOING CASHLESS: ADOPTION OF MOBILE BANKING IN NIGERIA (Odumeru, 2013) shows trialability is an important determinants of the adoption of mobile banking.

It was observed that there was lack of sufficient literature on the influence of trialability. Two available literature had differing opinion on the aspect. Further the trialability in Saudi Arabia was influenced by the age profile and educational profile of the respondents.

The merchant perspective:

The Diffusion of Innovation can be explained in a Centralised / Decentralised Model. In the Centralised Model approach, it is often a firm/ merchant that encourages its users / herd to adopt a new product/ innovation by various adoption strategies. The other side of the. Also it is the merchants that generally pay for the diffusion of innovation. This aspect has been studied in very few papers as revealed by the review of literature.

In a concept paper examining the role of competition on the merchants side of the mobile payments platform in Germany in the Conference paper "The Role of Competition in the Adoption of Mobile Payment among merchants" (MOORMANN, 2018) the main aspects of competition proposed for investigation were **intensity of competition, competitors' orientation, competitors' innovation propensity, spatial proximity, and organizational proximity to competitors**. While **intensity of competition** is used as an independent variable impacting the adoption of mobile payment, the other factors are used as moderators of this relationship. This implies, in addition to the central hypothesis that a more competitive environment will stimulate the adoption of mobile payment, that competitors' propensity to innovate, being acquainted with competitors' moves, having shops in similar locations, and perceiving competitors as similar organizations to one another will positively moderate this impact. In addition, the costs of introducing mobile payment are included as a further moderating variable, since costs often represent a critical motive in investment decisions.

In another paper "Effects of a Technological-Organizational-Environmental Factor on the Adoption of the Mobile Payment System" (Gyamfi-Yeboah KWABENA1 Q. M., 2021) ; study is to investigate the effects of technological-organizational-environmental (TOE) determinants on the adoption of MPS and its impact on SMEs' firm performance. The findings of the study include the statistically significant effects of technological (relative advantage and compatibility), organizational (top management support and employees' readiness), and environmental (social influence and competitive pressure) factors on the adoption of MPS. Furthermore, this study also proved the positive and statistically significant effect of MPS on SMEs' performance.

These aspects on the supplier side of the diffusion process have scope for further investigation.

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