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A Multi-Country Assessment of Mobile Payment Adoption

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Abstract

Mobile payments (m-payments) are seen as having a bright future. However, the adoption of m-payments has been uneven globally. Different countries have different adoption experiences. In this research, we ask the following question: "What are the factors that account for different patterns of adoption of mobile payments in different countries?" We use Actor Network Theory (ANT) to examine the research question and the issues surrounding the phenomenon. We propose several factors as the determinants of m-payment adoption in a country and present several mini-cases to support our propositions.

Keywords: Mobile payments; m-payments; technology adoption; m-payment adoption; actor network theory; multi-country adoption; global adoption; multi-partite adoption; quasi-currency; synergy.

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Introduction

Mobile payments (or m-payments) have been widely touted ever since it became apparent that mobile phones would be ubiquitous consumer devices. An m-payment technology allows consumers to use a mobile device to initiate, authorize, and confirm a financial transaction (Au and Kauffman, 2007; Dahlberg et al., 2007). Although the most commonly used device is mobile phone, m-payments are also possible on devices such as tablet PC, personal digital assistant (PDA), smartphone, and any terminal which has the capabilities of executing a mobile payment (Karnouskos and Fokus, 2004). In general, however, an m-payment refers to the type of payment carried out by a mobile device which has mobile phone capabilities (e.g. smartphone), and not solely wireless capabilities (e.g. tablet PC). For the purposes of our study we define m-payments as any financial transactions, whether in-store or remote, executed on mobile devices.

Various technologies have made m-payments possible, chief among which are short message services (SMS) and near field communications (NFC). PayPal (www.paypal.com) and Vivotech (www.vivotech.com) are organizations which have incorporated SMS and NFC based m-payment solutions, respectively, on a wide scale. However, the adoption and implementation of m-payments using these technologies have been uneven in different countries. For instance, m-payments have been very successful in countries such as Japan and South Korea, but not in the United States. There have also been similar mixed results in other developed countries such as France and the United Kingdom. Interestingly, however, the idea of using a mobile form of payment has been adopted readily by some of the previously unbanked markets. Egypt and the Democratic Republic of Congo are examples where consumers have begun to use mobile devices as a form of quasi-currency (Batchelor, 2007). Figure 1 shows different m-payment maturity levels in different countries.

The current state of global m-payment adoption leaves us with an interesting question: "What are the factors that account for different patterns of adoption of mobile payments in different countries?" As we will discuss in the subsequent sections of this paper, different theories have been offered to explain different aspects of technology adoption phenomena. However, the

question we have just posed above calls for a theory that can provide a comprehensive analysis of the complex and multi-partite nature of global m-payment adoption.

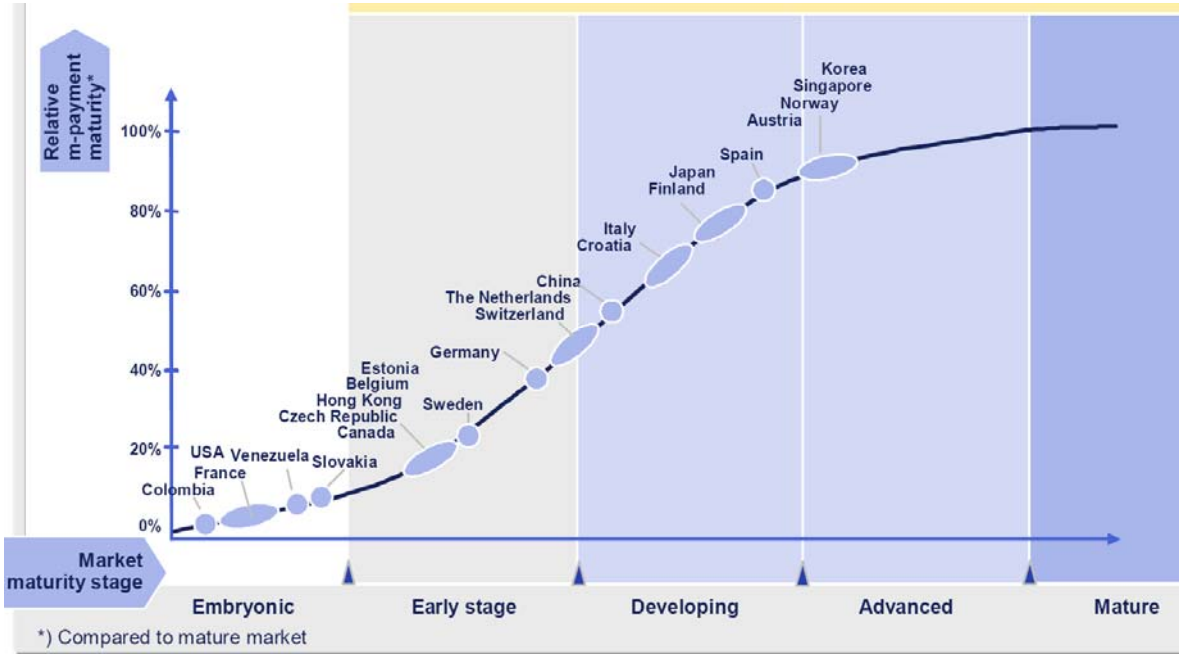

Figure 1: State of M-Payments Adoption in Different Countries[1]

We propose a framework based on Actor-Network Theory (ANT) to investigate the various aspects of global m-payment adoption. Although ANT is still rarely used in IS/IT research, it has been recognized as potentially helpful for understanding the complex interactions associated with IT (Hanseth, Aanestad, and Berg, 2004; Walsham, 1997). The theory has been employed to interpret processes associated with technology implementation initiatives in different contexts (Mitev, 2000; Sarker, Sarker, and Sidorova, 2006; Walsham and Sahay, 1999). In this research, we apply ANT to the m-payment domain and use its tenets to derive propositions supported by mini-cases.

Background Literature

The extent of mobile technology infrastructure in different countries is likely to have an impact on how much adoption and diffusion of m-payments we are likely to see around the

[1] Source: Arthur D. Little Analysis

world. Numerous studies have been published in the area of mobile technology adoption. Some have focused on exploring the adoption of mobile technology services in a particular country (Blechar et al, 2006; Lu et al., 2008; Passerini et al., 2007; Sangwan and Pau, 2005). Various models (e.g., Gao and Damsgaard, 2007; Fang et al., 2005) have also been proposed to describe and explain the phenomenon.

M-payment adoption has been studied in the context of different countries such as the United States (Dewan and Chen, 2005), Finland and Dutch (Mallat et al., 2004), and Switzerland (Ondrus and Pigneur, 2006). What is currently lacking, however, is a comprehensive investigation of the adoption of the technology across different countries. Various factors such as population characteristics, infrastructure, and regulations may play differently in different countries. These factors are rooted in diverse areas such as economics, information technology, sociology, and psychology. The ANT theory is an interdisciplinary approach to the social sciences and technology studies. Before delving into ANT, we will briefly discuss other relevant theories, each of which has a unique perspective on the adoption of technology at different levels of analysis.

Technology Acceptance Model

Technology Acceptance Model (Davis, 1989) is an extension of the Theory of Reasoned Action (Fishbein and Ajzen, 1975) and the Theory of Planned Behavior (Ajzen, 1991). The model predicts a user's acceptance of information technology and its usage on the job. At the core of the model is the theory that the intention to use a system is determined by its perceived usefulness and perceived ease of use. TAM is based on three key assumptions which limit its ability to explain m-payment adoption. First, TAM assumes that only one specific technology is available for potential users (Eikebrokk and Sorebo, 1998). This may not be the case in an m-payment environment where alternative solutions are usually available for consumers. Second, TAM does not consider social influence in the adoption of new information systems (Malhotra and Galletta, 1999). Third, TAM assumes that there are no barriers that can potentially prevent an individual from using a particular system if he or she has chosen to do so (Mathieson et al, 2001).

Theory of Diffusion of Innovations

The Theory of Diffusion of Innovations (Rogers, 1995) explains IT innovation adoption through rational theories originating from economics, sociology, and the communications theory. However, the decisions to adopt are concerned with well-defined innovations (e.g. farmers using pesticide), and the population that adopts an innovation is fairly homogeneous with a particular set of boundaries. These set of assumptions can pose a question in the case of a complex network such as the one brought upon by m-payments technologies. Due to the existence of factors such as demographics, regulators, and vendors, m-payments may need to be constructed socially as well as economically.

The stakeholders include not only consumers, but also the manufacturers, service providers, and various regulatory bodies. Furthermore, unlike Rogers' assumption, the diffusion of an innovation may not necessarily be a sequential process. It is possible that in order to achieve successful global adoption of m-payments there may be a requirement for considering the existing infrastructure. Similarly, Rogers' (1995) ideas about adoption rates being solely a function of push and pull forces may not necessarily be true in the case of m-payments. Taking into account only features of technology as the main source of push does not provide a comprehensive picture. In this case, due importance needs to be given to other factors that co-exist, e.g., banks and mobile phone service providers that need to work together to provide the services to the consumers. Also, pull forces may not always be dictated by a consumer's rational choice. A consumer's reason to adopt m-payments may be based on a variety of factors, e.g., lack of choices.

Technology-Organization-Environment

Technology-Organization-Environment (TOE) is a framework used to examine firm-level adoption of various IS/IT products and services including electronic data interchange (Kuan and Chau, 2001; Mukhopadhyay et al., 1995). Developed by Tornatzky and Fleischer (1990), the framework identifies three contexts of a firm: organizational, technological, and environmental. Organizational context is defined as descriptive measures such as firm size. Technological context is the set of technologies relevant to a firm. Environment context is the place where a firm conducts its business, e.g., its industry and competitors. Although it offers a relatively

comprehensive perspective, TOE is mainly appropriate for investigating technology adoption in the organizational level.

General System Theory (GST)

GST proposes that units should not be treated individually, but instead should be represented as a whole. It provides an interdisciplinary approach with the primary purpose of integrating the various sciences, both natural and social (Bertalanffy, 1968). Some of its principles include equifinality, feedback, and causality. Equifinality states that in order to reach the final stage of a system, different initial conditions and different ways can be taken. Feedback is central to the concept of the theory of communications, and states that it is necessary for the stabilization of a certain action. GST also states that isolable units acting in one-way causality is insufficient. Since systems can be complex, due to notions such as wholeness, there is a need to think in terms of systems of elements in mutual interaction (Bertalanffy, 1951).

GST identifies stakeholders but does not necessarily include them as a part of the overall system. In addition, GST is a way of thinking and not a way of analysis. This problem may be confounded by a recommendation on part of GST that in the design of systems the input variables need to be kept at a minimum (Ashby, 1956). This limits GST's ability to provide a comprehensive perspective of the interrelationships between the different stakeholders, something very critical in the multi-partite adoption analysis.

Actor Network Theory (ANT)

Actor Network Theory (ANT), developed by Latour, Callon, and Law, was originally designed to explain sociological events. However, it has recently been used in IS research as well (Tatnall and Gilding, 1999). It came about to overcome the distinction between the social and technological worlds by symmetrically viewing the actors in the former and artifacts in the latter (Yoo et al. 2005). ANT allows us to identify all stakeholders of a network, as well as their goals and the alignment of the goals. We next discuss the major elements of ANT.

Actors

In ANT, actors and artifacts are sometimes referred to as 'actants.' Central to ANT is the belief that a society is a collection of heterogeneous networks, where actants include not only actors, but also infrastructure, regulators, mobile devices, antennas, etc. Callon (1986) maintains that in ANT a network evolves over time due to an amalgamation of allies joining the network.

These allies can be human as well as non-human artifacts. The objective of an actor (Callon 1986; Latour, 1986; Czarniawska-Joerges, 1991) is to search for other actors and to make them indispensable until a point when network stability is reached.

There are two different types of actors: macro-actors, and micro-actors. Callon and Latour (1981) introduce a concept of a macro-actor. Macro-actors may include corporations, technologies or institutions, and are what may influence the micro-actors (e.g., the consumers). Therefore the dynamics are such that an outcome may depend on how various macro-actor forces are played out with one another (Czarniawska and Hernes 2005).

Networks

In ANT, networks are the unfolding of interactions between actors that produce certain configurations. Therefore networks in ANT do not have any structural properties. There are no systems of nodes and lines that need to be discovered, but the analysis continues until a certain saturation of factors that can explain stabilization is achieved. Thus analysis is done recursively between the analyst and the phenomenon under study. Incidentally, an analysis at the surface level can include factors such as changes in market share, and resistance to change. However, it may well be the case that certain networks are either partially visible, or even invisible to the macro-actor (Law 1992). This idea is not elaborated upon and is similar in methodology to Suchman's (1987) argument that the analysis in this case would be a failing at the macro-level, since the micro issues may not be identified.

Translation

In the translation process, a macro-actor takes the role of a leader and attempts to align the interests of as many micro-actors as possible by interpreting their needs and values. This is important since the predominant job of an actor-network is to grow until a point of network stability. Therefore there is a requirement to enroll or link to other actor-networks and non-human artifacts. This can only be done via communications between actants. Greater interactions will assist in the development of a broader network that represents the emergence of a community. Furthermore, this step may induce an element of recursion with other leaders that may emerge due to the continued translation process. There are four steps in the translation process (Callon, 1986):

1. Problematization: Here the macro-actor defines a problem in a way that allows other actants to recognize it as their problem as well. The purpose is to promote a discussion in which a possible solution may be reached.
2. Interessement: Based on the problematization step, the macro-actor assigns willing actants roles which will evolve around a particular course of action.
3. Enrolment: As already noted, the goal of an actor-network is to grow, but to reach a point of stability the roles carried out by other actants must lead to more actants joining their network. This process may involve rewards, persuasion, and negotiations.
4. Mobilization: Once the process of enrolment has begun, the macro-actors try to communicate broadly with the actor network and all of its actors to ascertain the status of the network as well as explore possible ways to entice new actors to join. There may be a possibility here of reassignment of roles, as well as an overall change in the structure of the network due to the enrolment of new actors. This is where the recursive nature of translation will mainly occur.

The availability of tools and resources is also what may transpire the level of success or failure (Callon and Latour, 1981) of a translation. One way of recognizing this is to view the regulating or controlling effects of technology on action (Thompson, 1967; Perrow, 1986). An example of this would be a cell phone which only operates on a certain frequency (GSM). This both defines and limits the user's range of actions, since the device only does certain things and can only be operated through certain operations. In some ways this also defines the user and his actions. In addition, the stabilizing and regulating effects of artifacts are not limited to single mechanical/special actions in a dyadic relation but also extend to other processes within large networks or systems (Czarniawska and Hernes 2005).

Inscription

Inscription is also relevant to ANT's principle of nonhuman actors. It is the process through which certain interests are protected. Through inscription, actors embed their agendas into technical objects (e.g., the mobile phone system). As inscriptions become more stable and routine, they are less likely to be challenged at a later time (Bowker and Star, 1994).

Alignment and Irreversibility

Callon (1991) asserts that at certain points in the translation process, there is some degree of agreement which he calls "convergence." This is closely related to the extent to which actors can agree to a translation. Callon (1991) calls this *alignment*. Hannemyr (2003) elaborates on this idea by stating that when a strongly aligned and coordinated network emerges, we may have a translation where it is impossible to go back to a point where the translation was only one among others. This concept called irreversibility (Callon 1991; Akrich, 1992) is a sign that a critical translation has been achieved.

Black Boxes

At this juncture, technology and communication adoption have reached a steady state whose contents and operations are no longer relevant (McBride 2003). The reason for that is that technology is then treated as part of everyday life, embedded in social activity and taken for granted. These black boxes can form around actors, issues, structures, and technologies, and have properties of irreversibility.

In summary, ANT views change as an emergent process that is initiated and guided by actors with certain interests. The respective agendas are enacted through the processes of translation and inscription, in which other actors who at first may be an opposition are enrolled in the effort. Via inscription, the actors promoting change gain stability and control over the network. Once the technologies become embedded, they assume the role of actors in the network.

ANT View of M-Payments

Figure 2 displays an ANT view of m-payments. For illustrative purposes we have used the United States as an example. Other countries have similar structures. For example, in the United States, the Federal Communications Commission (FCC) is an overseeing regulatory body as far as telecommunications is concerned. In South Korea and Japan, the equivalent agencies are the Ministry of Information and Communication and the Ministry of Internal Affairs and Telecommunications, respectively. The overall network can be divided into macro-actors and micro-actors. Also part of the network are proprietary technologies, competing technologies, and threatened technologies which will be described later.

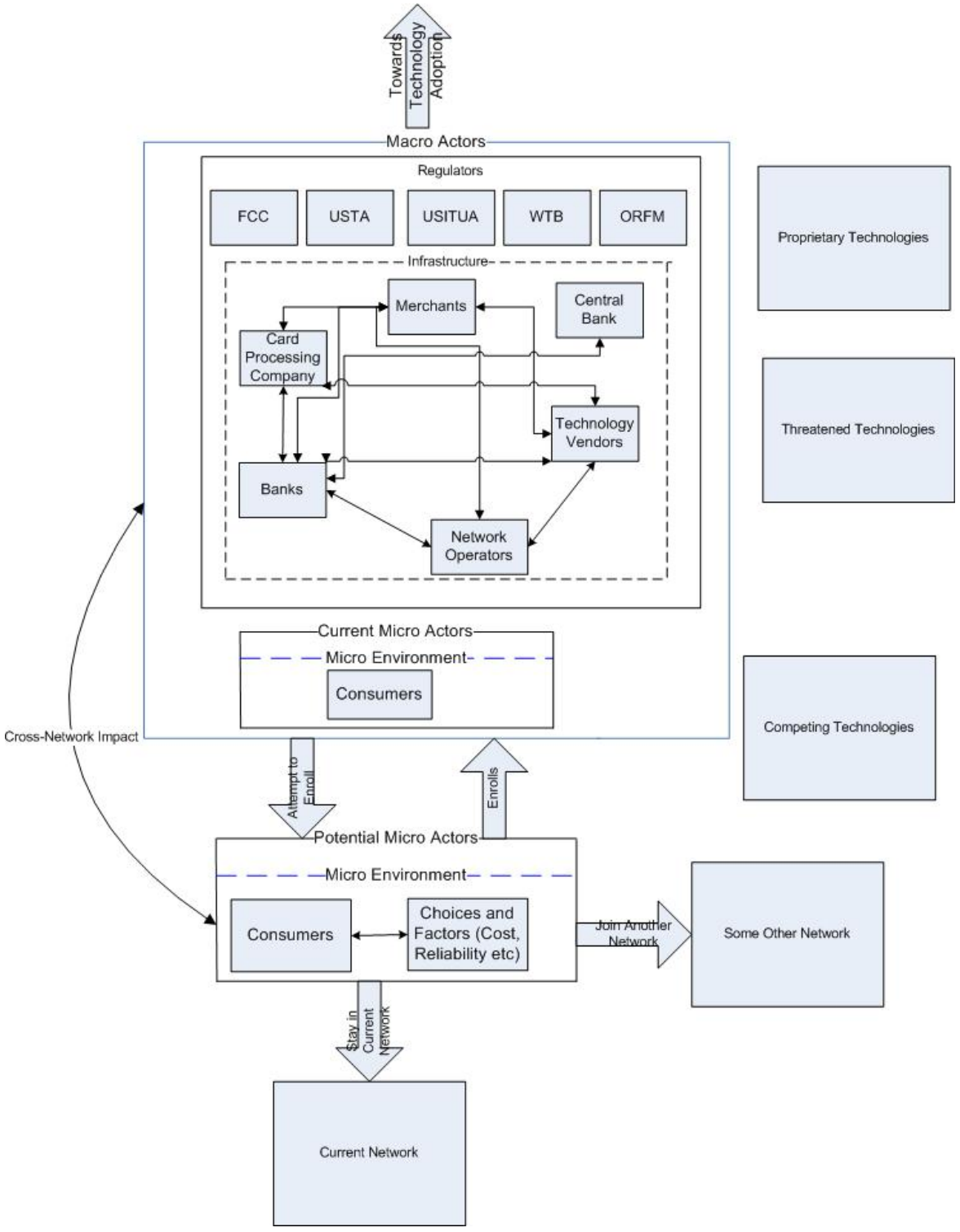

Figure 2: ANT View of M-Payments

Macro-Actors

The macro-actors consist of various regulation agencies which play an integral role in the development of a telecommunication network. In the United States, these regulation agencies include:

- Federal Communications Commission (FCC): An independent agency which regulates most U.S. mass communications, and is directly responsible to Congress.
- United States Telecommunications Association (USTA): Advocates issues related to the telecommunication industry in front of the Congress, the White House, and the media.
- United States International Telecommunications Union (USITUA): Improves coordination and cooperation between the U.S. Government and the private sector companies to formulate policies, and standards that impact how they do international business.
- Wireless Telecommunications Bureau (WTB): A division of the FCC which handles all FCC domestic telecommunications programs and policies. These also include wireless technologies.
- Office of Radio Frequency Management (ORFM): Represents the Department of Commerce (DOC) in several fora, and consists of an overview of various services and software tools.

Regulatory agencies have a direct impact on m-payments infrastructure. In the United States, the major entities that own or operate the infrastructure include:

- Banks: This is where customer accounts are located. If a customer makes an m-payment, the card company associated with it (e.g. Visa, MasterCard, etc.) will allow for a deduction to be made from the respective bank accounts.
- Card Processing Companies: These companies facilitate the process of clearing payments made through Visa, MasterCard, or any other card company.
- Merchants: They can be the retailers which offer a customer an option of using m-payments as a method of completing a transaction. These transactions can be based on

the Near Field Communication (NFC) protocol, or some other form of contactless payment.

- Central Bank: In the United States, the central bank is commonly referred to as the Federal Reserve. The Federal Reserve has many functions among which is the function of supervising and regulating banking institutions to maintain the soundness and safety of the nation's banking and financial system.
- Technology Vendors: These are the cell phone manufacturers. They may also be companies that develop technology that combines cell phone functionalities with a payment feature.
- Network Operators: These are the wireless service providers. In the United States, major network operators include AT&T, Verizon, and Sprint PCS.

Current Micro-Actors

These are the current members of the macro-actor network, representing the existing consumers. The micro-environment represents the current surroundings of each member (a consumer). For example, the micro-environment could consist of a consumer's living conditions or lifestyle.

Potential Micro-Actors

These are the consumers outside the network which the macro-actor network wants to enroll. It consists of potential consumers who have a micro-environment which could dictate if the consumers do want to become a part of the bigger network. The decision might also be affected by factors such as costs of switching, and reliability of a network.

Proprietary, Threatened, and Competing Technologies

Baskerville and Pries-Heje (1998) maintain that there are situations where barriers to Diffusion of Innovations (DoI) may be needed. These positive barriers include the proprietary, threatened, and competing technologies. Proprietary technologies are usually kept confidential by an organization to preserve its interests. Threatened technologies are existing technologies that are in danger of being supplanted by new technologies. Competing technologies are technologies that organizations use to block the DoI of its competitors.

ANT Process of Technology Adoption

The primary function of macro-actors is to enroll micro-actors in the network, and grow till a point of critical mass or stability is reached. In ANT terms this is also classified as irreversibility. As Figure 2 shows, the infrastructure is enveloped by the regulators since they often determine the shape and direction of an infrastructure. The regulators also in some ways decide on the fairness of technology adoption. The infrastructure's backbone is formed through a conglomerate of agencies. The directional arrows do not represent a causal relation but instead are the flow of communications between each of the pieces of the infrastructure. As previously noted, macro-actors also include the current micro-actors. These micro-actors are a part of the existing macro-actor network, and the objective in this case is to prevent them from exiting the network.

In an attempt to enroll potential micro-actors, the macro-actors have to consider if their goal aligns with that of their potential consumers. If they do, then enrollment will occur. Otherwise, the potential micro-actors have the option of either joining another actor network or stay in their current one. The existence of a cross-network impact allows for the macro and potential micro actors to ascertain if there is a probability of aligning their goals. It is important to note that in the case of failure to enroll, it may not be necessary that the potential micro-actors choose a network in the future which may offer the same type of service (m-payments). It may well be the case that their micro-environment and the factors they consider as being critical to adoption deem it difficult to make a switch.

ANT in its original form is a very generic theory. This to some extent is due to the tradeoff between being comprehensive while also maintaining a level of generalizability across different domains. Regardless, the idea of translation and its four steps are important drivers in explaining completely the problems faced when it comes to m-payments adoption in different countries.

Problematization, the first step in translation process, is arguably the most crucial step. In this step, macro-actors need to carefully formulate the problem that they will later use to convince potential micro-actors to enroll in their macro-actors network. For example, m-payment vendors may see a problem that the existing payment technology may not be practical for situations faced by people in high population density urban areas where a large percentage of

consumers commute. In those cases people will almost "demand" integrated technologies such as m-payments, because they can be used to perform tasks quickly and efficiently.

In the problematization step, m-payment service providers as one of the macro-actors may also identify a question associated with low population density areas. For example, how can m-payments succeed in places which lack the infrastructure available to their counterparts? In these cases, the role of government cannot be ruled out. Another question which may be raised is related to cost. Unusually high switching costs may result in few people being enticed to adopt m-payments. In this case, macro-actors may need to identify possible benefits that outweigh the costs.

Interessement, the second step of translation, looks at the use of willing participants of the actor network with assigned roles. The decision of selecting participants is based on problematization. Some of the willing participants in this case are potential actants who can potentially be enrolled based on factors such as convenience offered by m-payments.

Enrolment, the third step of translation asks the question of the reason to adopt m-payments. Generally if the problematization and interessement have been clearly defined, then here specific arguments can be made regarding the shortcomings of an existing method of payments. Enrolment also leads to the issue of standardization, but based on the previous two steps that question will need to be answered not only in terms of technology, but also pricing and cost structures.

Once the first three steps of translation have been completed then a question which is posed is if the market is ready for m-payments? Willing participants do not imply long-term success of a particular technology. Issues of true irreversibility need to be addressed in terms of culture, affordability, and even use of "older" technologies. This is where mobilization which is the fourth step of translation comes in. It can be considered as a function of translation, with the function itself being defined by the first three steps. Mobilization has a recursive quality because even though it follows enrolment an actor network continues to grow with more actants joining. Alignment plays an important role here because in order to gain a high degree of mobilization a high degree of alignment is needed. This alignment can be that of technology introduced for

consumers who may or may not be inherently innovative in using new technologies. In either case, each consumer's problematization needs to be correctly identified.

Realignment of Goals and M-Payment Adoption

Actor network theory emphasizes the interactions between actants—both human and non-human—to build a network that achieve certain ends (Fox, 2000). In this case, the end is successful adoption and implementation of m-payments. This in essence is a heterogeneous network in which the elements are defined by their relationship and degree of collaboration with other elements. In their interactions, actants (including the technology) build alliances with each others. These alliances, however, may change over time due to constant realignments among the actants (Hanseth and Braa, 1998; Underwood, 1998).

Realignments create synergy. The degree of synergy between macro-actors will determine their ability to enroll micro-actors. As Figure 2 shows, in an m-payments environment, macro-actors include banks, network operators, card processing companies, and the merchants. The actor network theory suggests that these macro-actors need to continue to realign themselves to create the necessary synergy to attract the micro-actors (i.e., the consumers) to adopt m-payments. These macro-actors should work together to combine their strengths. For example, banks have the trust of their customers and understand the customers' financial services needs. Network operators have the infrastructure for implementing m-payments as well as an installed base of mobile phone customers. Each of them may benefit from the strengths of the other through the realignment of their goals, creating the synergy needed to enroll the micro-actors (Karnouskos et al, 2003; Ondrus, Camponovo, and Pigneur, 2005; Ondrus and Pigneur, 2007). The degree of synergy varies from country to country, resulting in different levels of m-payments adoption. We propose the following:

P1: Mobile payments adoption in a country will be positively affected by the degree of synergy between the macro-actors in that country.

Mini Case for P1: Mobile Telephony of Serbia is able to provide m-payments solution to its subscribers due to the collaboration between banks, application service providers, and mobile network operators. This alignment of the stakeholders addressed the three main parts of the system: core of the mobile payment system, interface to application service providers on one

side, and interfaces to the banks on the other. Since its inception in 2006 DinaCard has witnessed growth in the payment cards market with over 24 million transactions and a turnover of almost 67 billion (www.dinacard.nbs.yu). The company also holds one-third of the market. Source: Delic and Vukasinovic (2006).

The Socio-Cultural Perspective of M-Payment Adoption

Urban cities that have a fair amount of commuter traffic (e.g., Hong Kong, New York, and Tokyo) allow for various other facilities such as contactless payments at vending machines and parking kiosks, which act as non-human actors as specified by ANT. Consumers in these cities also receive tailored offers based on their demographic profile, purchasing preferences, and transaction history (Fichman and Cronin, 2003). In these cases portability is an attractive option (Kopomaa, 2000). This is especially true if the commutes are long and public transit is heavily used for travel. With significant idle time, consumers are now probably more inclined to using digital multimedia and not newspapers and magazines as in the years past (Aoyama, 2003). This is similar to ANT's view of interactions between micro-actors and an artifact since increasing use of these technologies leads to configurations which translate into a natural habit for a consumer to use m-payments as commonly as drinking coffee. More than half of the commuters in Tokyo Prefecture use public transit to get to work, with an average commuting time of 43 minutes (Japan Statistics Bureau, 2002; Ministry of Construction, 2000). The US Census of 1990 states that New York and Chicago are the only two of the 50 largest cities by population in which the average commute time is greater than 30 minutes, with 53% of the commuters in New York, and 30% in Chicago using public transportation[2].

Urban areas with high commuter traffic also present network operators greater market potential. As an extension, in this urban environment different network operators compete against each other to gain a larger share in terms of total number of subscribers. Hence in this case, an operator is more likely to invest in infrastructure since the market opportunities are greater, and it also provides for some degree of product differentiation. According to Shlovski and Mainwaring (2005) and Jasper (2000) these high population density areas usually have

[2] US Bureau of the Census, http://www.census.gov/population/socdemo/journey/city.txt

apartments which are small in terms of square footage, and usefulness of mobile technologies in the event of excessive travel may also impact their adoption. Though the two mentioned studies consider mobile technologies in the context of mobile phones, the relation between a consumer and acceptance of that technology can be extended to an m-payments service since the arguments made are in favor of convenience, and improved services; both of which are cardinal to m-payments. This is not too dissimilar from interessement, which is one of the four steps of translation. Here a particular micro-actor's role may revolve around an action such as improved service which would lead to a course of action in the shape of greater adoption.

P2: Mobile payments adoption in a country will be affected by how its consumers associate values to it.

Mini-case for P2: Transport for London (TfL), Barclaycard, AEG, O2, Nokia, TranSys and Visa are working towards an extensive m-payments network. They are planning to consider the pros and cons of two separate but interlinked services: paying for travel on the capital's buses, trams and tubes using a phone with inbuilt NFC technology, and mobile payments for low-value items under £10. The use of m-payments for low-value items is a useful tool for commuters when it comes to adopting the technology since they predominantly have small expenditures when using public transportation. Once adoption at low-value items is ascertained the concept may be extended to higher value items. In a scenario a woman realizes that she left her wallet on the kitchen table but in the end she finds out that not only she did not miss it, she also did not have a need for it. A consumer's mobile account is not charged instead, he or she can top their Oyster credit using cash or cards at designated recharge stations. Source: Holland (2007).

In Hong Kong, a system called Octopus has over 9 million users, and almost all Hong Kongers between the ages of 15 and 65 use their cell phones to hop on a public mode of transport, swipe their cell phones and pay the fare. They can use the same mode of payment to pay at a local Starbucks. In this scenario the adoption of m-payments revolves around the habits of a regular commuter. During commutes, a person may only have time to pay for coffee or a newspaper, before taking the next bus to work. In the United States a concept which allows for a contactless form of payment called Speedpass which uses RFID has taken

hold. Though this technology is not used in conjunction with cell phones, there are over 7 million people that use Speedpass to pay for gas at any Speedpass gas station. Speedpass may also be used to purchase items from any store which accepts this technology. Source: McLindon (2003).

The mobile phone has already impacted people's lives, but there is more work ahead for the mobile phone. The SIM card can also be used as a debit and credit card. In Kenya, where there are not too many bank branches, M-PESA, a mobile-payment scheme run by Vodafone, and Safaricom, with the backing of the British government's Department for International Development, has created an alternative to banks. Most M-PESA customers are non-banked users, but they withdraw cash and make payments using their mobile phones. Their cash points are a network of airtime sellers dotted around the country—Safaricom shops, petrol stations, or any other shop used to handling cash. Once a customer's identity is verified through their telephone number, the agents will facilitate a transaction. The service has been fairly successful. Since its initial roll in March of 2007, by June 2007 there were about 150000 consumers using the M-PESA service. This rate of adoption is extremely high if compared with the introduction of SIM card technology in Finland which occurred in 1992[3], and the relatively low adoption of m-payments in that country. Source: The Economist (2007).

In countries such as Egypt and the Democratic Republic of Congo, consumers have realized that cash-in/cash-out and person-to-person transfers are supported through sharing of minutes between multiple prepay SIM cards. If a prepay SIM card has a zero balance, then a consumer can cash-in by adding money to the account at an m-payment provider's station. When a consumer remits money to his/her family, and the family is on a similar GSM network, then he/she can send a SMS message with a code. The family on the other end can take that code to an m-payment provider's station and for a small fee either transfer the sender's unused SIM card minutes to their own account, or cash-out by getting a monetary value of the transferred minutes. There is some anecdotal evidence which suggests that in

[3] http://www.cellular.co.za/gsmhistory.htm

developing markets such as these, these informal transfers have lead to minutes being treated as a type of quasi-currency. The minutes can be converted back and from into cash, or can be re-bartered. The concept of quasi-currency is not too dissimilar from m-payments. Both are non-traditional forms of performing transactions which were previously not possible due to a lack of infrastructure and high costs involved with traditional monetary transfers performed by banks. In these markets the probability of success of m-payments adoption is high since the cost of each transaction will be less, and the consumers are somewhat used to the idea of using a newer and simpler form of transactions performed at a nonbanked level. Source: Donner (2007)

We need to consider the existence of an extensive legacy system (wired) in developed countries in sharp contrast to a weaker legacy system in countries such as China. A strong legacy system may itself play the role of a black box, thus making it difficult for a new network (m-payments) to grow when consumer habits are already entrenched in the old system. Canada is a part of the developed economies, however, when it comes to mobile technologies and services, it is in need of further development. The traditional school of thought such as leaving mobile technology to market forces may not suffice since it only facilitates the strongest actors in the market. Compared to the rest of their counterparts, Canadians pay more for a service, which is one of the reasons why mobile technologies have not developed there, unlike in other Organization for Economic Co-operation and Development (OECD) countries. A research study concluded that the average Canadian cell phone user pays 60% more than the average American and 19% more than the average European[4]. Even with projects such as Wireless Payment Services (WPS), the elevated prices to consumers along with early and high penetration of wire lines remain a significant barrier for wide scale adoption of m-payments (Uribe, 2007).

Corollary 2.1: Mobile payments adoption in a country is affected by the degree of presence of incumbent technologies.

[4] The Seaboard Group, *Lessons For Canada: Wireless Pricing- A Cross-National Survey: U.S. Canada, and Europe*, July 2005, online: http://www.seaboardgroup.com/main/index.php?option=content&task=view&id=290&Itemid=123

Mini-Case for Corollary 2.1: In Serbia, mobile payment provider Upaid in conjunction with Visa has introduced an m-payments service using SMS. The reason for investing in Serbia is that emerging markets are considered to be more open to innovative services from small providers which do not have entrenched legacy payment systems. With lower PC and Internet penetration alongside not too many advanced banking services, the probability of consumers adopting m-payments is much higher. Even in that case, Upaid does have to make concessions in order to capture the most consumers. One approach is to keep services initially offered relatively simple. Once the market has become established, more complex services can be introduced. Source: TMCNet (2007).

For organizations that are a part of an actor-network one of the goals of introducing m-payments in the economy is to gain cost savings. However, its goal in an information society (processes of social transformation facilitated by information technologies) is to embed itself in an increasing number of day-to-day activities exploiting demographic characteristics such as an individual's inherent innovative nature (Agarwal and Prasad, 1997; Yi et al., 2006) and subsequent adoption of a technology. The innovative nature of a consumer shows how an information society is part of processes which are evolutionary. This is because each one of these processes can be dependent on the functions they facilitate. For example, leisure and entertainment are possible functions. This is important in the case of understanding technology adoption in different countries. This may explain how Japan is considered to have an economy which is highly informational, but its society is anything but that (Aoyama and Castells, 2002; Castells, 1996). This is distinctive from the technology adoption pattern in the United States which lags behind Western Europe and Asia in terms of wireless technology (Tarasewich et al., 2002). The primary reason for the lag is that the United States has not experienced the same demand for increased mobile communication capacity as Europe and Japan have. Fewer Americans use wireless devices than people living in Asia or Europe, and those who do use them less and for fewer tasks (Mentrup, 2000).

Corollary 2.2: Mobile payments adoption in a country is dependent on degree of homogeneity between consumers.

Mini-case for Corollary 2.2: The Japanese consumers being a part of a technologically advanced society have adopted m-payments more quickly than consumers in other parts of the world. In 2005, NTT DoCoMo introduced the m-payments platform in Japan which was preceded by the 2004 launch of its wallet phone service which incorporated electronic money functions. NTT DoCoMo has large potential consumer base due to its 50 million plus consumers. The company has also started an iD credit card brand for card issuers, which allows consumers to make credit card payments using the Osaifu-Keitai (secure wallet) mobile phone equipped with wallet functions. iD works with handsets based on Sony's FeliCa contactless smart card technology, and NTT DoCoMo has sold over 10 million of the phones in Japan to date. Source: Card International (2006).

Primary Point of Contact in M-Payment Adoption

So far we have addressed the importance of having a high degree of synergy between the macro-actors and of understanding the micro-environment of a micro-actor. The micro-environment of a micro-actor complements the enrolment strategies of the macro-actors. For a macro-actor to enroll a potential micro-actor, a representative or a primary Point of Contact (POC) needs to represent a macro-actor. The POC is the one who the consumer communicates and establishes a relationship with. Usually the stakeholder who controls the billing gains a competitive advantage because of its access to consumer information which can provide incentives towards increasing sales opportunities. Billing in mobile services has traditionally been a forte of mobile service providers, but this view is challenged significantly due to the complex nature of an m-payments network. The success of proximity payments depends on the development of an effective and efficient billing system for m-payments (Becker, 2007). The stakeholder who is responsible for this role is the POC for the other macro-actors, since that stakeholder may also have to manage the costs associated with managing the billing systems and supporting customer service requirements. The decision to choose a POC is dependent on factors such as consumer trust and impact of macro-actor on the market as an individual entity. Having a POC other than a mobile service provider does not negate its usefulness pertaining to having access to strategic marketing data, as in that case a “walled garden” type of model can be set-up (Rao and Minakakis, 2003). In this model third parties are aggregated under a branded POC

umbrella. This will allay concerns of micro-actors regarding security and privacy of m-payments since the POC has already had a prior relationship with the micro-actor, and there is little danger of consumers being deterred by a brand name they cannot recognize.

Having a single POC which represents all stakeholders creates an advantage. It creates personalized relationships with each customer which in turn strengthens the mutual benefit of both parties through individualized and value-added contacts (Shani and Chalasani, 1992). Here the idea is that a POC with a strong relation with the consumer (micro-actor) will lead towards greater consumer satisfaction and loyalty. Therefore it is vital that the POC selected from various macro-actors fully represents not only the stakeholders, but also has the ability to align their interests with that of the consumers. This is a difficult proposition for the POC since inscription on each of the two sides (macro- and micro- actors) will make initial adoption towards irreversibility a challenge. Hence, a POC not only has to have a grip on consumer information, but more importantly it should be a macro-actor which is best placed in the market to successfully introduce an m-payments solution. In some cases the POS may have to acquire some elements necessary to have a higher probability of success. For example, the widely accepted success of NTT DoCoMo is partly due to the business model used by the company. NTT DoCoMo purchased a bank to handle account management, and credit issuance processes, hence establishing an end-to-end service delivery model: acquisition, payment network, and issuance (Sekino, Kwon, and Bong, 2007).

P3: Mobile payments adoption in a country is affected by the relationship between the primary point of contact and the consumers.

Mini-case for P3: In 2002 SK Telecom and KTF introduced m-payment programs called Moneta and K-merce respectively. Both are considered two of the largest mobile carriers in South Korea. The programs proved to be unsuccessful due to a number of reasons, one of which was that the banking and credit card agencies were not enthusiastic about the large revenue share garnered by the mobile service providers. Some of the other reasons were that the consumers were unhappy about the program itself since it required scrolling through many options on a small screen, and merchant point of sales terminal were not compatible with both Moneta and K-merce. In 2003, LG Telecom and BankOn partnered to introduce a

single-IC chipped m-payments service which unlike the previous two failed ventures enabled consumers to use their mobile phones at more merchant point of sales terminals than the predecessor technologies. This case shows how the initial POCs which were the mobile service providers were not appropriately placed to successfully introduce m-payments. In the end it was the heavy involvement of the financial institutions which lead to the success of m-payments in South Korea. Source: Bradford and Hayashi (2007)

The Micro Environment and M-Payment Adoption

Micro-actors in ANT may decide to join a particular network due to the facilitators and inhibitors present in the micro-environment. Some of these facilitators and inhibitors are cost, quality of service, and Therefore it is the responsibility of a macro-actor to ensure that at least on its end a micro-actor is considered, especially in the case of pricing and cost structure.

From the consumer perspective, the cost concern is typically one of the most important issues in mobile technology usage (Plouffe et al., 2001). These costs can be categorized as equipment costs, access costs, and transaction fees (Constantinides, 2002). When switching to different products or online services, consumers must deal with non-negligible costs (Chen and Hitt, 2002). High cost will be one of essential factors considered by consumers when deciding whether to use a particular mobile technology in different countries (Gruber, 2001). Furthermore, frustrations due to problems related to poor quality of service may incur a cost on part of the consumer (Wu and Wang, 2005). ANT's concept of alignment is highlighted here, since it a convergence towards low cost for consumers and a high quality of service will assist in greater adoption of m-payments. Hence, there is a need to find solutions which can reduce the costs, and entice present and new customers, with the idea that these investments lead to long term profits from a stream of loyal customers. Otherwise, consumers may obtain these services from alternative sources (Rock, 2000).

Developing a brand and a mobile payment system strategy which focuses on a consumer's ability to pay using a mobile device as was the case with the success of i-mode in Japan may not be enough in other countries. Users and merchants require additional benefits such as reduced transaction times and costs (Ding and Hampe, 2003). M-payments, which have generally been used for low-value payments might not be adopted widely when cost efficiency is not achieved.

According to Visa International in order to gain cost efficiency, a transaction value of 12 euros is needed. A lower transaction will cause a merchant to pass an extra 3 % transaction cost to the consumer. In that case adoption will be problematic since a consumer will have an alternative to using m-payments, that is credit and/or debit cards. An example of this could be Vodafone and its 100 million subscribers. If Vodafone was to invest heavily in m-payments, possibilities of transactions costs affecting the consumers may negate the intended diffusion of the technology and its adoption (Ding and Hampe, 2003). This problem can be confounded if poor quality of service, and problems associated with switching networks results in a degree of uncertainty on the consumer's end (Ba and Pavlou, 2002). Prior studies (Forsythe and Shi, 2003) in this area have concentrated on uncertainly due to electronic commerce transactions. Since m-payments involve the use of a mobile phone either at a point-of-sales terminal or remotely, it is similar in nature to an e-commerce transaction, since the vendor may not physically be present in front of the consumer. Hence questions such as quality of service may be raised equally at both ends. For example, a consumer may equate quality of service to an immature technology, and therefore not adopt it. This will lead to what ANT calls a lack of enrollment. The low quality of service may lead to a lack of adoption of a system such as m-payments, the actor-network does not grow, and hence a point of network stability is not reached.

P4: Mobile payment adoption in a country is affected by how correctly the micro-environment of a micro-actor is identified.

Mini-Cases for P4: In a qualitative study carried out in Helsinki, some interviewees said that they had refrained from using mobile payments because of premium pricing. The argument that the item paid for with a mobile phone usually costs more than the same item paid for with cash. Hence, there is no real need for using an m-payments solution due to the presence of a cash alternative. Interviewees were critical towards the premium pricing and it discouraged them from using mobile payments as shown by the following two responses:

> *"I noticed that I could pay for purchases on a vending machine with a mobile phone, but it was more expensive than using coins and I thought it was totally unnecessary and I used coins."* (*Young Adults)*

"I think it is a precondition in new things like this that it won't cost more. I won't pay for paying with it. I think it kills good ideas from the start because nobody is ready to pay for it as long as debit cards and others work as well as they do." (Students) Source: Millat (2006).

In South Korea, m-payment ventures and their adoption have been successful. The credit card companies there share a 2.5 percent cut of all m-payment transaction fees with the other stakeholders. One percent is used to subsidize the cost of m-payments phones for consumers, and 0.3 percent goes to the wireless carriers, leaving the rest for the credit card companies. Distribution of cost benefits amongst the relevant stakeholders offsets some of the costs associated with using m-payments, which gives greater incentives towards adopting m-payment. Source: Acket et al. (2006).

A European Union (EU) directive allowing pre-paid credit to be used for non-mobile services may assist in the wide spread adoption of m-payments. However, unpredictable delays can produce an unsatisfactory experience. For example, while someone is waiting for a train, they may decide to buy a drink from a vending machine on the platform. Instead of trying to find the correct change, they simply send a SMS (Short Message Service) to pay. However, the current SMSC (Short Message Service Center) architecture may cause a delay in the message path, and there is no guarantee which will arrive first – the drink or the train! Consumers routinely demand instant gratification and the highest quality of service, so the adoption of m-payments is highly dependent on a speedy and dependable service with meaningful feedback during the process. To counter the delay problem Intelligent SMS routing has been introduced by Telsis. This form of SMS routing combines an intelligent load balancing service and high performance SMS sending resulting in a more efficient and stable routing system, thus reducing potential for messages being delayed. Source: (Telsis, 2007).

London and Paris-based company Upaid wanted to increase the quality of service of their m-payments solution while also keeping costs low and flexible. The company partnered with IBM and launched a service called HiPAAS (Highly Intelligent Payment Authentication and Authorization Service) now called UPP (Unified Payment Platform). In this system the

consumer has the capability to attach different services offered from different organization to a cell phone and make direct mobile payments. For example, if a consumer's electric utility uses HiPAAS, then once the utility generates a bill, a text message is sent immediately to the consumer's cell phone. By entering a unique PIN code the consumer can pay the bill, and the system automatically negotiates the back end processing all the way to the consumer's bank. The quality of service is high in this model since the consumer does not have to initiate a bill paying session, and the overall process occurs quickly. Cost savings on the backend are attained due to streamlining of administrative processes since cash is transferred to providers faster, thus improving working capital efficiency. These savings are then transferred to the consumers, thus having a positive impact on adoption of m-payments. Currently this system is being used successfully by corporations such as MiBill (www.mibill.com) and eCommlink (www.ecommlink.com). (Source: IBM, 2006).

Market Structures and M-Payment Adoption

The micro-environment in an actor-network may be impacted directly by market conditions in different countries. These market conditions may also dictate what type of mobile technologies may diffuse successfully. Therefore, organizations have to adjust to these conditions, and develop their network accordingly in terms of gaining more subscribers, and partnering with all the relevant stakeholders of m-payments technology shown in Figure 2. In that figure we also see the possible role of alternative networks or technologies in the market. As previously stated at the user level, there is an option to either join an m-payments network or to go to some "other" network. The presence of these alternative networks makes adoption of m-payments in a country challenging.

The use of mobile phones appears to be ubiquitous around the globe. By 2001, Luxembourg and Taiwan had one of the world's largest penetration rates of mobile services (i.e. text messaging and voice dialing) at 96% (Jang et al., 2005). These penetration rates have also been shown (Kalba, 2007) to be extremely varied – from more than 100% (Jamaica) to less than 1% (Papua New Guinea). Even at regional levels they range from 84% (Europe) to 15% (Africa). These variations do pose some interesting research questions regarding globalization of mobile technologies and subsequent m-payments adoption. With over 2 billion (Smith, 2005) mobile

users around the world, it does become important to investigate if these variations are possibly a result of average income and product innovation as this technology moves from high-income markets to emerging ones. Figure 4 shows some of the top network operators and their subscribers. If a particular operator has a lion share of the subscribers, then a possibility of monopolizing a market may exist. However, care needs to be taken with regards to the complexity of the market due to the nature of each operator's competitors. For example, NTT DoCoMo is the largest network operator in Japan, and hence could lead to pushing a technology to its consumers. On the other hand, China Mobile and China Unicom both represent a large share of subscribers, and hence the market complexity may represent additional challenges to m-payments adoption. This also holds true in the case of Verizon and AT&T in the United States. In the case of each of the mentioned organizations, ANT's view of inscription plays an important role. Each of these macro-actors has to protect their interests, since various forms of investments have occurred to make the development of an m-payments infrastructure a reality.

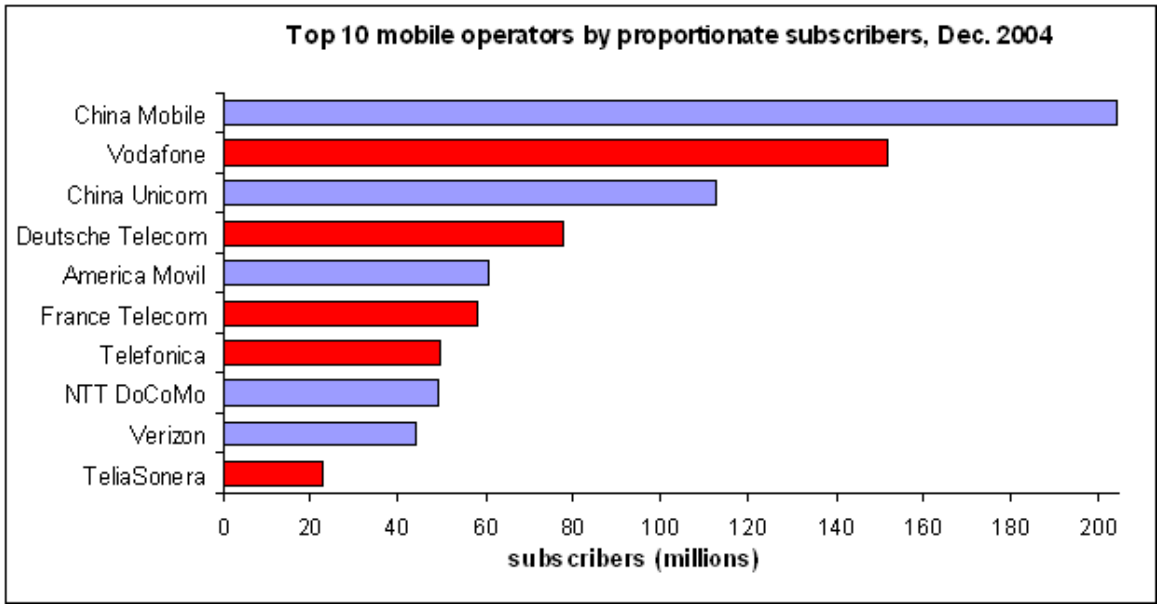

Figure 3: The Top Network Operators[5]

[5] *Source*: International Telecommunication Union, PTO database.

Bandwagon affects may also play a role in enticing consumers to adopt m-payments. On the other hand, a distinction needs to be made between bandwagon affects and their relation to the income-penetration rates in different areas. Imitation and a strong retail presence may not have a significant impact if people in certain areas are unable to afford the technology. In the more affluent areas where income-penetration relations are weak, observability and a particular lifestyle may be dictated less by a consumer's financial ability, but more by the differentiating factor of the product, and recommendations of other consumers. ANT states that the availability of tools assists in adoption. These tools are not always technology related, but as already mentioned may be equated to a consumer's ability to afford a particular service.

P5: Mobile payments adoption in a country is affected by its market conditions. These conditions can be influenced by the presence of alternative technologies, and the presence of bandwagon effects.

Mini-Case for P5: The Asia-Pacific region has its mobile pioneers - South Korea and Japan. They are also the nations to beat when it comes to m-payments. Korean and Japanese manufacturers have introduced integrated solutions into handsets that allow them to be used in a wide variety of ways, from various forms of identification to credit cards. The lesson learned from these countries is to start with "easy, convenient" transactions that get users comfortable with the mobile payment concept. This in turn will result in greater adoption of a new technology such as m-payments. In both South Korea and Japan consumers were first given access to technologies which allowed them to browse the Internet. As a consequence, mobiles can become the primary Internet access device for hundreds of millions of people in a matter of years. Much like Japan or South Korea, once consumers are accustomed to using their phones to send e-mails or conduct routine transactions, it should not be hard to convince them to trust their mobiles to do even more, whereby opening the door for m-payments adoption. Source: (Hopfner, 2007).

Smart Communications, the leading mobile network operator in the Philippines used a unique strategy to penetrate the banked and the non-banked markets. In 2000, Smart along with Mastercard introduced Smart Money, which allowed consumers to perform m-payment transactions. They reduced the size of airtime units to 2 pesos (less than one-third of one US

cent) for low-income customers. This service (Pesa Load) also allowed prepaid card users to allot unused airtime to family and friends, thus, informally spreading the use of m-payments while also catering to the fact that the consumers were in the low income bracket. They (Smart) later changed their m-payment model to allow for international remittances to help migrant workers send money to their home countries. The m-payment adoption due to these two services has been successful which can be judged from the fact that Smart has gone from 50,000 outlets at the time of launch to over 850,000 today. The success is not entirely surprising since ten million employees from the Philippines who work overseas remit $14 billion each year, and therefore there is a constant demand for the improvement of m-payments infrastructure. (Source: KPMG, 2007).

Unlike Japan and South Korea, m-payments adoption has not succeeded in the United States. However, a generational study carried out shows that 16-to-19-year olds are more inclined to use mobile devices as a payment device than older people (late-30s to early-40s). In the U.S. mobile payment platforms are being offered by companies such as MasterCard, TextPayMe, PayPal, MobileLime, and Visa (PR Web, 2006) to potentially service a fraction of more than 243 million[6] existing mobile phone subscribers in the U.S. PayPal's m-payments service is SMS based, and it coincides with the preferences of the younger users since they prefer texting others. Using SMS to send text messages is a daily routine for them. Therefore, form factor will play an important role in increasing adoption of m-payments because of the possibility of using a contactless device with a graphical user interface which is becoming increasingly ubiquitous. Though majority of the m-payments market has not moved far from the trial stages, potential solutions to the slow adoption rates such as including reward programs in m-payments have been proposed. However, there is not enough data to support any conclusions. Source: Bruene (2006)

The Presence of Catalysts in M-Payment Adoption

Up to this point we have presented arguments which show how m-payments adoption has been inconsistent in different countries. We have argued from the viewpoint of the macro-actors (stakeholders), and the micro-actors (consumers). An m-payments network as defined by ANT

[6] Source: International Asociation for the Wireless Telecommunications Industry. http://www.ctia.org/

has been presented (Figure 2) which clearly defines the roles of macro- and micro-actors, while also highlighting the presence of alternative and competing technologies. However, in reality these roles may not be so clear. For example, if synergy was easily attainable, then we should have seen adoption of m-payments fairly quickly. Since we have not seen m-payments adoption it does follow that there may be factors which affect synergy of a group. In those cases we propose that catalyst organizations such as governments need to play a more active role in the development of an m-payments network.

Hesitancy on the part of a macro-actor such as, financial institutions, and network operators may be due to skewed risk/reward long term scenarios. Based on our research it does seem that m-payments are a long-term proposition where evolution, and not revolution, may hold the key. In these cases the role of government cannot be discounted since it can step in and initiate the process m-payments adoption. This can be in the form of subsidies or regulatory support. However, we should not relegate catalysts to governments only. A catalyst can be any organization which can take the role of a macro-actor and have the ability to sustain, albeit not perpetually, an m-payments solution. In majority of the cases these catalysts may have control over the market conditions. For example a catalyst may be able to understand the risks associated with m-payments in the short term, but be able to recognize the importance of an evolutionary approach towards m-payments adoption. In that case a catalyst's ability to have some control over the market may allow for a strategy of incrementally introducing technologies which lead a consumer towards m-payments in the shape of additional roles for his/her mobile device. Once the consumers accept additional roles for their mobile devices, then an evolutionary/incremental innovation towards m-payments will more likely have a chance of success (Fagerberg and Verspagen, 2002). This approach was particularly successful in Japan, where a mobile TV service was introduced prior to the introduction of m-payments. Two different arguments can be made here. It may not be the case that the Japanese organizations intended to introduce m-payments, and use mobile TV as an intermediary. It could be coincidental that m-payment was successful regardless of it being preceded by mobile TV. Another argument is even if the success was coincidental, it is difficult to state that the consumers were not sensitized to the idea of using a cell phone for purposes other than standard voice calling and text messaging. Had m-payments

been introduced prior to mobile TV, then it may have been difficult to gauge what would have happened had the consumers not felt at ease about incorporating sensitive financial information in their mobile phones. This is supported to some extent that the consumers have been able to use their mobile phones for limited forms of electronic banking in the past. An incremental step towards m-payments seems like a logical choice for an organization. This method of introducing m-payments may lead to greater opportunities for enrolment, and what ANT calls as the final goal, that is to reach a point of irreversibility, where m-payments is embedded as part of daily life of a consumer.

P6: Mobile payments adoption in a country may be affected by the presence of catalysts. Catalyst organizations can initiate the process of m-payments adoption in the event traditional macro-actors are unable to synergize. However, the role of a catalyst need not be perpetual.

Mini-Case for P6: The Chinese Government recognizes the potential for the m-payment market, and therefore assists in the development of a low-cost, non-cash payments network in rural areas. The contention is that this development is essential to increasing rural spending and closing the wealth gap with urban areas. The Government of China is also proactive in directing the banking sector to develop a new system for rural payments. Recently the Chinese Ministry of Finance announced that it is planning to subsidize 13 percent of the prices of mobile technologies. The plan is to narrow the wealth gap by almost $14 billion by the year 2010 (China View, 2007). This development is critical in China because almost 83 percent of all payment transactions in rural areas are cash based, and building a network of cash machines would cost billions of dollars. Currently 15 percent of the rural population uses mobile phones, with 75 percent of the subscribers using SMS (Bellens et al, 2007). An m-payments solution which uses SMS technology may enhance its adoption rate. This is in contrast to m-payments which will only cost tens of millions of dollars since most of the wireless infrastructure is already in place. In either case, a technological solution for an electronic form of payment in low population density areas can be widely adopted if there is a combination of government as well as private level contributions, both in terms of financing and infrastructure. Adoption is more likely to be

increased in this case since the banking reach is extended, and transactions are converted from cash to an electronic form, whereby increasing efficiency as well. Source: KPMG (2007).

One of the reasons why m-payments have taken off in Japan and is the strong retail presence of the chief drivers of mobile innovations. In Japan, due to its market dominance NTT DoCoMo can impose a new system from the top down. This dominance allows for the company to impose new cashless, contactless payment schemes with relative ease. Prior to m-payments the company introduced new applications such as web page viewing through mobile phones and consumers got used to their phones as lifestyle tools rather than just communication devices during that time. Those consumers have demonstrated that they are more eager to adopt m-payments, and therefore it is not entirely a surprise when overall adoption of m-payments in Japan proved to be successful. As of 2007, DoCoMo has over one million users who use their mobile phones for credit card purchases. The company also has over 20 million stored-value mobile wallets in place (Bruene, 2007). This is a fairly good adoption rate for a service launched in 2004 (Friedrich et al., 2005).

Conclusions

Today many information technologies, including m-payments, involve multiple stakeholders in their adoption decision, making the process increasingly intricate. The complexity of this so-called "multi-partite technology adoption" phenomenon calls for a comprehensive examination of the issues surrounding the adoption process. The global characteristic of m-payments adds to the complication. As a result, different countries experience different patterns of adoption.

In this paper, we use Actor Network Theory (ANT) to help us identify the factors that contribute to the m-payment adoption process in a country. Our analysis suggests that many of the factors that affect the adoption of m-payments are associated with how the stakeholders (macro- and micro-actors in ANT's terminology) interrelate with each other as well as with the conditions of the environment in which the macro- and micro-actors operate. And because these interrelationships and conditions differ between countries, it should come as no surprise that

different countries experience different patterns of m-payment adoption, despite the fact that one of the main goals of m-payments is to allow a global and universal payment mechanism.

Our contribution lies in the fact that we show how the complex multi-partite technology adoption phenomenon can be analyzed through the exploitation of a single theory (i.e., the Actor Network Theory), and the seemingly disorganized and unrelated m-payments adoption events around the world can actually be discussed and presented in an integrated fashion. The results of this study may be beneficial for managers who are looking for ways to promote the adoption of m-payments or other technologies that face similar multi-partite adoption issues.

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