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Can mobile eco-systems for technical innovations be standardized? – The case of mobile wallets and contactless communication

Abstract

This paper puts focus on the application of Near Field Communication technology (NFC) to mobile payments. Uncertainties about global policies open for a variety of local business policies. Taking into account different representations of actor interaction as described by different eco-systems by different policy forums the main research question to be discussed in the paper is: Can policies or standards describing actor roles and responsibilities for technical innovations like mobile payments remove obstacles for introduction of the innovation?

Different types of industry forums are not only involved in strictly technical matters but also discuss and describe "visions" about how a new technique might be applied in business life. They suggest different "business architectures", (not only a "technical architecture"), where roles of different type of actors and relations between actors are outlined based on ideas about so called "eco-systems". Against this background the paper first discusses how NFC enabled mobile payments currently attracts a lot of attention and identifies four possible development paths "making it happen". The paper discusses and compares how global policy networks describe the technical and business architectures for mobile payments. The paper uses a business practice analytical framework and an industrial network framework to identify major problems in connecting global and local policies. Some comments on further research finalize the paper.

JEL codes: L52, L96, M16, O19, O32

Keywords: Near Field Communication, mobile payments, global policy, business architecture, policy forum, industrial networks, practice

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1. Introduction

Development and trends for mobile payments

Near Field Communication (NFC) is a new, still evolving, contactless mobile technology that is used or has the potential to be used for a number of new mobile services used for local transportation, ticketing, parking, control, getting access etc. For some of the applications payments are required in association with the mobile service. Mobile payment solutions often in combination with contactless technology have been proposed and tested for several years. At the Mobile World Congress in Barcelona February 2011 applications based on Near Field Communication (NFC) technology did get a lot of attention.

NFC technology and contactless services can be related to mobile phones in several ways. In the simplest form the NFC technology is used as a stand-alone feature for contactless cards, e.g. access or key cards, credit cards or for public transportation tickets. The NFC contactless features combined with some kind of mobile service can also be integrated in the mobile phone using built-in hardware, separate memory cards or using software functions. In this case the NFC service is linked to the phone as a physical device. Finally, the NFC based services can be stored in the SIM card of the mobile phone. The use of this kind of NFC service needs to be linked to the control of the SIM-card and the mobile phone subscription. Hence, the mobile operator will be involved.

Many technology providers, mobile operators, Internet companies and credit card companies have presented their visions in the area of mobile contactless payments. Companies like Apple, Google and Paypal have plans and different forms of payment solutions. Nokia Money[1] and Ericsson Money Services[2] are initiatives from the telecom manufacturers.

When it comes to contactless mobile payments a number of industry organizations like NFC Forum, MobeyForum and GSM Association (GSMA) have specified and proposed technical standards for functionality and interfaces. These organizations also make descriptions (visions?) of a kind of "business architecture" where relations between different types of actors are outlined. So called "eco systems" are described in white papers, see examples from GSMA[3] and NFC Forum[4].

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[1]Nokia money" http://europe.nokia.com/find-products/nokia-money

[2] http://eipa-acc.ericsson.com/thecompany/press/releases/2011/02/1484586

[3] GSMA white paper "Pay-Buy-Mobile Business Opportunity Analysis", November 2007; http://www.gsmworld.com/documents/gsma_pbm_wp.pdf

[4] NFC Forum white paper "Essentials for Successful NFC Mobile Ecosystems", October 2008, http://www.nfc-forum.org/resources/white_papers/NFC_Forum_Mobile_NFC_Ecosystem_White_Paper.pdf

Problem area and research question

Description and standardization of technical features have been ongoing for many years by organizations like NFC Forum and GSMA and now agreed standards are available. Despite all these proposed technical solutions and eco-systems no generally accepted solution or approach for mobile payments can be identified. The NFC based contactless payment services still do not take off on large scale.

GSMA has identified a number of reasons for this. Besides a lack of commercially available NFC handsets a number of business-related issues are often mentioned as "roadblocks", (Markendahl, 2011) page 150:

- Unclear business models
- Lack of contactless Point-of-Sales (PoS) infrastructure
- Co-operation between ecosystem players

This creates uncertainty and ambiguity among business actors about roles and relationships in business networks. The different types of "forums" are not only involved in strictly technical matters but also discuss and describe "visions" about how a new technique might be applied in business life. They might suggest some kind of "business architecture", (not only a "technical architecture"), where roles of different type of actors and relations between actors are outlined based on ideas about so called "eco-systems". There is no commonly agreed policy or standard describing the business architecture and how different actors should organize their cooperation.

Thus, for application of NFC to mobile payments, the uncertainty about global policy opens for a variety of local business policies. Taking into account different representations of actor interaction as described by different eco-systems the main research question to be discussed in the paper is:

Can policies or standards describing actor roles and responsibilities for technical innovations like mobile payments remove obstacles for introduction of the innovation?

On one hand we have the "big and complex" descriptions of interaction between "many" actors aiming for a global (or at least a very well spread) solution. One the other hand we have solutions promoted by single actors or joint ventures with the aim to be a "dominating" solution at a specific market without any ambition to first establish some kind of agreement or standard.

When it comes to traditional credit card payment there already exists a globally accepted practice for both technical and business aspects. Hence, it is interesting to investigate to compare the business polices for NFC mobile payments with credit card based payments and also with other global standards, e.g. 3GPP for mobile communication, where this uncertainty cannot be identified.

Methodology and work flow

The *overall research approach* if focused on description and analysis of different mobile payment solutions. We try to describe the underlying business architecture with actors and the distribution of roles and responsibilities among actors. On one hand we have the visions and proposals for ecosystems for future solutions, on the other hand we have the actor interaction and cooperation strategies of existing mobile (contactless) payment solutions.

Data about current technology and business development have been compiled from *web pages* of technology providers and different industry organizations like NFC Forum, GSMA etc. White papers and specifications from these organizations are the main source for description of proposed future eco-systems.

Knowledge about existing systems is mostly based on *interviews* with technology and service providers, to a large extent this is based on (Markendahl, 2011). New interviews have been conducted during the spring 2011 with payment providers like Nets in Denmark, Payex in Sweden and with the technology provider Giesecke & Devrient. For description of existing solutions we use the ARA model (Håkansson, Snehota, 1989) where we describe the business architecture and actor cooperation by identifying groups of activities, distribution of activities among actors and the relations among actors.

The key component in the *analysis* is to compare the proposed eco-systems with the corresponding “eco-system” of the existing mobile payment service and identify what activities and relations that are the same, differ or are missing.

Outline of the paper

The sections of the paper reflect the different parts of methodology as described above, however the order of presentation is different from the work flow. First, we discuss how NFC enabled mobile payments currently attracts a lot of attention and presents four possible development paths. In section 3 we describe global industrial organizations: NFC Forum, Mobey Forum, GSM Association (GSMA) and European Payment Council (EPC) and in section 4 we provide examples of eco-systems presented by these organizations. Section 5 describes activities, distribution of roles and responsibilities among actors for a number of existing mobile payment solutions. Section 6 contains the analysis with a comparison of presented eco-systems and how it looks like in “real life”.

2. NFC and mobile payments

Mobile wallet concepts in general

It has been argued that NFC will be one of the future dominating technologies enabling consumers and businesses to use the mobile phone for an increasing number of new services. This has resulted in a large number of industry descriptions and representations on “what might happen and how it might work” in the near future. One of the most widely diffused “picture” launched by these organizations is focused on mobile payment solutions and *mobile wallet* applications based on NFC. The idea is that users should be able to store credit cards, loyalty cards, access cards “and tickets” in the mobile phone. The new emerging market descriptions entail many types of cooperating actors; banks, credit card companies, mobile operators, mobile service providers, trusted third parties, specialized payment providers – all connected in networks.

At the Mobile World Congress in Barcelona February 2011 it was evident that mobile payments is a hot issue. Companies that presented their plans and visions came from many “industries”, e.g. Google, Apple, Deutsche Telekom, Qualcomm, ZTE, LG Electronics. Trials are going on, or planned for the near future, in several locations with a variety of organizations involved. E.g. the city of Bordeaux will enable its inhabitants to pay with a contactless electronic purse, three major German mobile operators plan to launch their own payment schemes using NFC phones, Orange will introduce an NFC application for contactless prepaid payment cards, Ebay’s financial actor PayPal will conduct tests in the near future, Google has done tests in Oregon, etc.

The move from test status to full-fledged use of the mobile phone as a wallet presents companies in many industries with important technical and business problems, to large extent relating to network dynamics and network uncertainty. We can identify different development paths that can make mobile wallet services “to take off”, four of these will be briefly described below, this is similar to the approach in (Enqvist & Casey, 2010).

A single actor takes the lead

Both MasterCard and VISA have presented contactless credit cards, this functionality can be integrated in a mobile phone. The solutions presented by the credit card companies do not involve SIM cards or any mobile operators. New NFC enabled PoS terminals are needed but the credit card companies use the existing business architecture.

Another example is NTT DoCoMo in Japan that introduced mobile wallet services 2004. NTT DoCoMo involved merchants by deploying contactless PoS terminals. The company also entered the financial market, first with partners and later on by launching an own credit card brand, see more section 5. Here NTT Docomo created a new business architecture in order to offer the new services.

A number of actors from different sectors offer a service

In Japan the train operator JR East enabled customers to use the pre-paid local transportation tickets as electronic money for other types of purchases. The service was introduced by JR East in cooperation with the technology provider Sony and NTT DoCoMo, see more section 5.

Another example of solutions targeting a local or regional market is the SMS payment services, e.g. for local transportation or parking tickets. No contactless feature is used, the mobile phone is used as ticket machine, payment channel and as the ticket "itself". SMS payment and ticketing services are to large extent driven by the need to offer payment solutions not using cash or credit cards. Typically transportation companies, parking operators, mobile operators and SMS service providers are involved. The SMS payments require both new service platforms and new business roles and actors, see section 5.

A number of actors within the same sector offer a service

One example of cooperation between actors within the same sector is the "Bank SMS service" to be introduced in Denmark during the autumn 2011[5]. The solution is provided by Danish banks and the payment provider Nets. Unlike Premium SMS services the Bank SMS enables payments directly from the customer's bank accounts. Hence, the solution is competing with premium SMS services offered by mobile operators etc.

Another example is the formation of the joint venture with the US operators AT&T Mobility, Verizon Wireless and T-Mobile USA that was announced in November 2010[6]. The announcement confirms that Discover Financial Services and the US branch of the UK bank Barclays are involved in the joint venture called Isis. Initially Isis will build a mobile payment network that utilizes mobile phones to make point-of-sale purchases. Future plans include creating a mobile wallet service.

Denmark's four mobile operators in June 2011 announced a NFC joint venture seeking to roll out mobile wallets on their own terms[7]. The operators TDC, Telenor, TeliaSonera and 3 Denmark have formed the joint-venture to put in place a common platform and possibly a common brand for their planned NFC mobile wallets.

"Forums" define standards that enable adoption

The last development path is where different Industry organizations "Forums" define business architectures that will be agreed and used by many actors, see sections 3 and 4.

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[5] http://www.mobeyforum.org/content/download/13784/144058/file/EFMA_journal_BankSMS.pdf

[6] http://www.nearfieldcommunicationsworld.com/2010/11/16/35043/att-verizon-t-mobileconfirm-isis-mobile-payments-joint-venture/

[7] http: http://www.nfctimes.com/news/danish-telcos-form-joint-venture-keep-control-nfc-revenue

3. Forums involved in mobile payments

In the processes to develop ideas and formulate policies about “the mobile wallet” a number of industry organizations (Forums) are involved. Below we present NFC Forum, GSM Association (GSMA), Mobey Forum and European Payment Council (EPC).

NFC Forum

The Near Field Communication Forum was formed to advance the use of Near Field Communication technology by developing specifications, ensuring interoperability among devices and services, and educating the market about NFC technology. Formed in 2004, the Forum in 2010 has 140 members. Telecom manufacturers, application developers, financial services institutions and others work together to promote the use of NFC technology in consumer electronics, mobile devices, and PCs. The goals of the NFC Forum are to: i) develop standards-for NFC, ii) encourage the development of products using NFC Forum specifications, iii) ensure that products claiming NFC capabilities comply with NFC Forum specifications and iv) educate consumers and enterprises globally about NFC.

The NFC Forum has organized the efforts of dozens of member organizations by creating Committees and Working Groups. In June 2006, only 18 months after its founding, the Forum formally outlined the architecture for NFC technology. In 2009, it is time for the global NFC Forum to move from a “technology” to a “market and implementation” focus, by differentiating the growing members of the Forum into different groups. One group called “Implementer Members” is designed to further the NFC ecosystem and broaden the organization's global reach.

GSMA

The GSM Association represents the interests of the worldwide mobile communications industry. Spanning 219 countries, the GSMA unites nearly 800 of the world’s mobile operators, as well as more than 200 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers, Internet companies, and media and entertainment organizations. The GSMA is focused on innovating, incubating and creating new opportunities for its membership, all with the end goal of driving the growth of the mobile communications industry. The GSMA’s stated mission is to create value for operators and the mobile industry in the provision of services for the benefit of end users.

GSMA aspires to lead the policy debate and to represent the mobile industry to governments and regulators. It aims to ensure that the interests of the global mobile community are effectively represented in the public policy debate. Its Government Programme of events provides a framework for regular interactive dialogue and

relationship building between ministries, regulators and industry in both developed and developing countries. GSMA's Mobile Money Transfer (MMT) project focusing on international remittances and its Pay-Buy-Mobile (PBM) project aimed at the use of NFC for daily commercial transactions are initiatives in which the financial and mobile industries cooperate to develop global policies

MobeyForum

The purpose of MobeyForum is to create: "a prosperous Mobile Financial Services (MFS) Ecosystem, where our members are able to create new profitable business, based on the following principles:

- Provisioning of Mobile Financial Services is open and standards-based,
- The services are interoperable and targeted for mass-market,
- Customer have the freedom to choose any service provider
- The client trust in financial services is maintained.

MobeyForum's mission is to facilitate banks to offer mobile financial services through insight from pilots, cross-industry collaboration, analysis, experience sharing, experiments and cooperation and communication with relevant external stakeholders. One main focus of the forum is to build sustainable business model alternatives.

Liaison agreements with relevant industry organizations allow Mobey Forum to give its impact to the work carried out by the standardization organizations. Mobey Forum strategy is to be key source of independent industry information. Mobey Forum Member Meetings are global meetings. The Mobey Forum brings together industry leaders and has connections to leading industry stakeholders. Although Mobey Forum is driven by banks it is a multi-industry group containing all stakeholders of the MFS Business Ecosystem. In addition to the strong presence of leading International Banks there are key mobile operators, handset and "other relevant vendors and payment processors working together to create the future of MFS Business".

Mobey Forum Workgroups and Task Forces are actively working on creating a common understanding of business opportunities, trends and challenges of various mobile financial services areas: "Task Forces are bringing the industry leaders together - linking the parties cross industries that can solve the remaining barriers for creating a successful MFS ecosystem". Mobey Forum also co-operates with other industry organizations in the mobile financial services industry. Mobey Forum has a working relationship with European Payments Council (EPC), NFC Forum, InfoCommunicational Union (ICU), dotMobi Advisory Group (MAG), Open Mobile Alliance (OMA).

European Payments Council

The European Payments Council (EPC) is the decision-making and coordination body of the European banking industry in relation to payments. The EPC was established in June 2002 and adopted its current governance structure in mid-2004.The EPC develops the payment schemes and frameworks necessary to realize the Single Euro Payments Area (SEPA). SEPA is an EU integration initiative in the area of payments designed to achieve the completion of the EU internal market and monetary union.

The EPC, working together with mobile operators and other stakeholders, is in the process of establishing the necessary standards and business rules with regard to the initiation and receipt of credit, debit and card payments through mobile phones. The aim is to develop proposals that are ripe for collaboration and standardization and which form the basis for interoperability. The intention is to create a trusted and secure environment that multiple stakeholders can use to facilitate SEPA payments initiated through the mobile channel in a convenient way. A common technical interoperability and business framework will avoid market fragmentation which would hinder the emergence of open, non-proprietary technology standards for user-friendly mobile payment services. Cross-industry cooperation is established through collaboration with mobile operator associations, mobile payment pilot organizations and non-profit (standardization) bodies, including financial institutions, payment processors, system and infrastructure manufacturers and service providers. Through cooperation with these various organizations it is envisaged that the design of frameworks and supporting technologies will enable reachability for SEPA payment schemes via m-channels (mobile channels). Further development of contactless NFC-based payments is a project which enjoys the highest priority. To this end, the EPC is cooperating with the global mobile network operators represented by GSMA. It is stated:

”The standards, rules and practices developed by the EPC in this area will be made publicly available to market participants and providers within the m-channel value chain. It will be the responsibility of each of them, or of any grouping thereof, to decide when and how to adopt these, and in particular towards which segment or segments of the payments market their products and services will be geared.”

4. Eco-system Descriptions

Different organizations and companies present many descriptions of “Eco-systems” for NFC mobile payment services. In this section we will present some examples of how different industry organizations, Forums and companies use the term “eco-system”. First, a note on the term “eco-system” is provided.

Eco-system definition

In the early 1990s James F. Moore originated the strategic planning concept of a **business ecosystem**, now widely adopted in the high tech community. The concept first appeared in Harvard Business Review in May/June 1993. The basic definition below comes from Moore's book “The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems”,

“An economic community supported by a foundation of interacting organizations and individuals—the organisms of the business world. The economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. Over time, they co-evolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community because it enables members to move toward shared visions to align their investments and to find mutually supportive roles”.

Mobey Forum example

A typical representation of an eco-system with focus on actors is shown in Figure 4.1. The picture illustrates the need for new roles (Security Element Issuer, Security Element Vendor) and a new actor (Platform Manager) Hence, there is a mix of actors and roles, nothing is said about what actor that will take a new role.

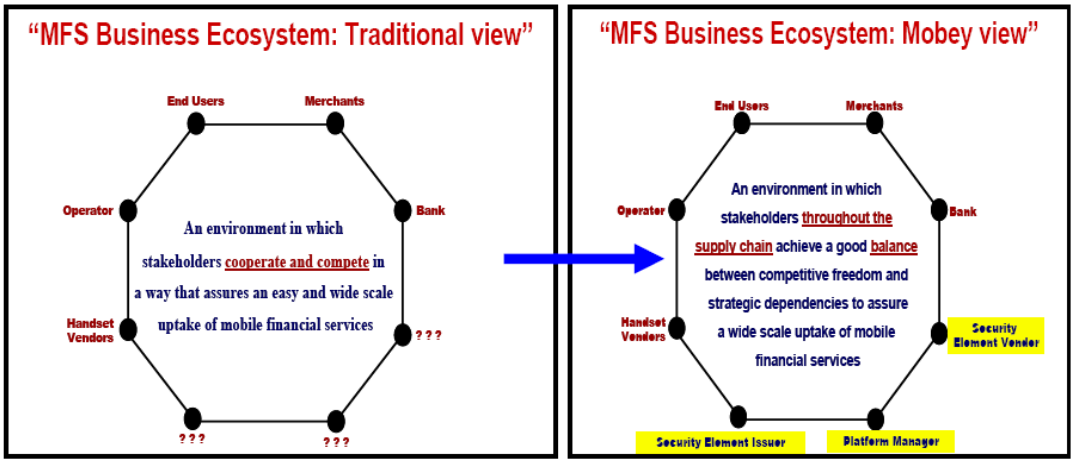

Figure 4.1 Description of Eco-systems provided by Mobey Forum

NFC Forum example

Other typical representations of eco-system are shown in figure 4.2. As seen a number of actors are listed. In one case an actor is in the middle in the other case the eco-system itself is in the middle. Note that “Secure elements” is included in one case. In figure 4.2 the focus is on the involved actors, nothing is said about activities, roles or relations

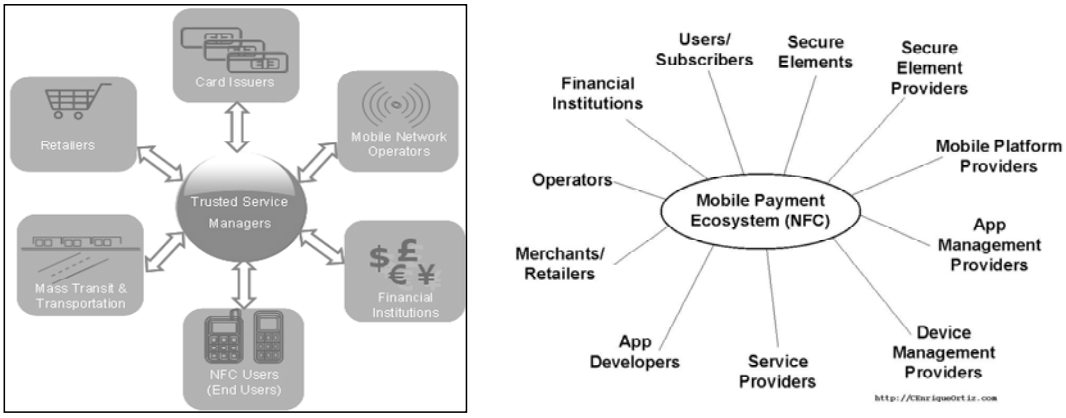

Figure 4.2 Descriptions of Eco-systems provided by NFC Forum

. Other representations of “eco-systems” include a mix of actors, functions and relations. However, often this mix is confusing and the area of use of this kind of representation is unclear. An example from NFC Forum is shown in Figure 4.3. Here actors and functions are mixed without describing what actor that takes the responsibility for a specific functionality. In addition, different types of business are mixed; mobile services, the handset business and the business of handset subsystems.

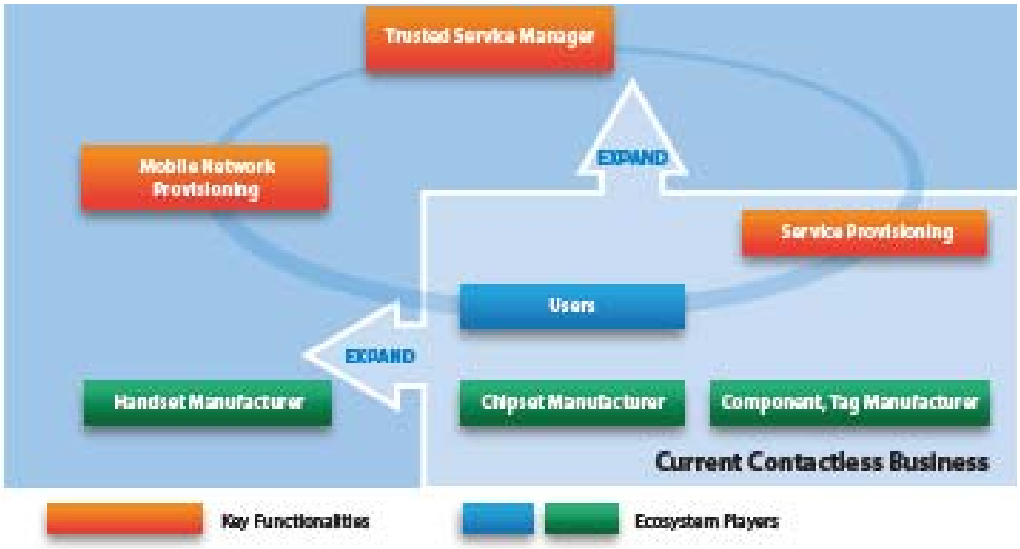

Figure 4.3 Example of eco-system from NFC Forum with actors and functionalities

GSM Association example

GSMA has similar representations but has managed to some steps further since their ecosystems describe actors, relations and to some extent the distributions of responsibilities. In Figure 4.4 a traditional credit card based ecosystem is compared with the so called “pay-buy-mobile” (PBM) ecosystem. Here, two new types of actors are added, mobile network operators (MNO) and the trusted service manager (TSM). The role of the TSM is to take care of the life cycle management of the NFC service and security applications stored at the SIM card.

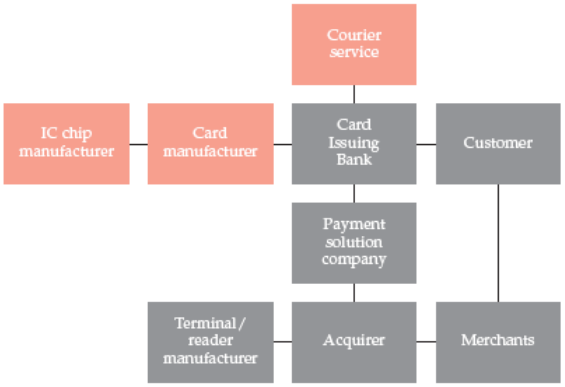

Figure 5 : Existing credit card ecosystem

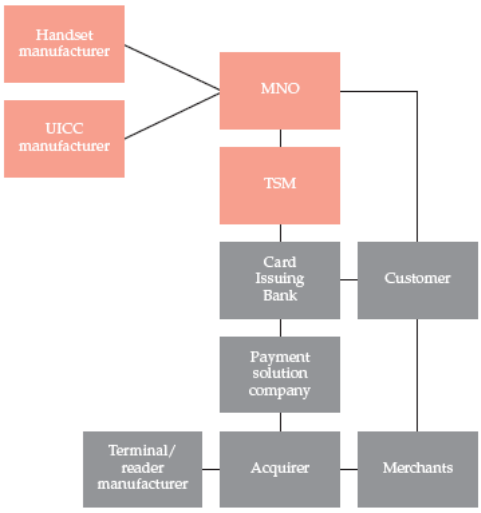

Figure 6 : Pay-Buy-Mobile ecosystem

Figure 4.3 GSMA descriptions of credit card based and pay-buy-mobile eco-system (from GSMA white paper Pay-Buy-Mobile Business Opportunity Analysis, 2007)

European Payment council

EPC has made descriptions of mobile payments based on SEPA (Single Euro Payments Area) card payment standard. These descriptions are quite detailed showing sequence of actions for transactions and activities performed by specific actors[8].

GSMA and EPC have jointly tried to resolve the uncertainty about the TSM role by defining technical and business interfaces for different actors taking different roles for this so called service management. A document was presented 2010 about distribution of service management roles and the business and technical requirements for TSM interfaces with banks and mobile operators[9].

[8]EPC - GSMA http://www.europeanpaymentscouncil.eu/knowledge_bank_download.cfm?file=EPC492-09 White Paper Mobile Payments version 2.0 finalrev.pdf

[9]EPC - GSMA Mobile Contactless Payments Service Management Roles Requirements and Specifications, October 2010

5. Existing payment solutions

As shown in section 4 there exist a large number of representations of different business eco-systems for NFC enabled mobile payments. At the same time we know that the services according to these representations do not take off – not even slightly. We also know that there exist a number of mobile payments and ticketing services, some of which also contactless technology, where there actually exist eco-systems for mobile payments. Are these "existing" services different to the NFC enabled payment services using eco-systems proposed by different Forums?

For the analysis and comparison in the next section we have selected a number of existing mobile payment solutions. The corresponding eco-systems will be described in this section in terms of actors and their relations and the distribution of activities among actors. We will start the description at the level of activities using SMS payment solutions and two types of emerging contactless payment solutions as examples, from Markendahl (2011). We also include examples from Japan including descriptions of contactless cards, electronic money and how mobile operators enter the financial sector.

Distribution of activities

Distribution of activities among actors for SMS payments for ticketing is shown in Fig 5.1 illustrating two options for distribution of responsibilities between actors. The SMS tickets and payments are handled by two or three actors, one or two intermediaries and a mobile operator. In the case of public transportation a new actor "Unwire" takes care of most of the activities for ticket issue, delivery and validation. In the other case with SMS parking tickets two intermediate actors, "EasyPark" and "MBLOX" are involved in handling of SMS tickets. In both cases mobile operators just are involved in the billing of end-users using the phone subscription.

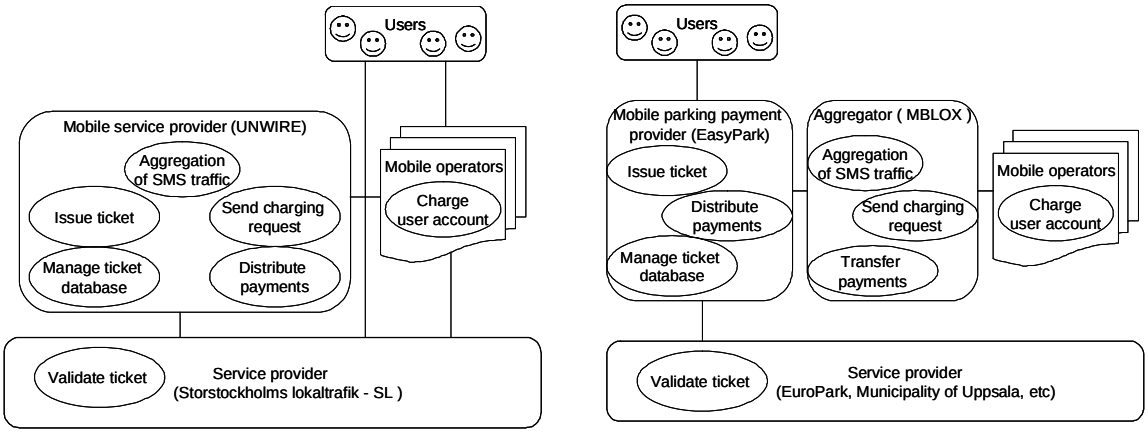

Figure 5.1 Distribution of activities among actors for two types of SMS ticketing services to the left: SMS tickets for public transportation, to the right: SMS based parking tickets

Other examples are shown in Fig 5.2 for two new mobile contactless payment solutions provided by the small start-up Payair and by the payment provider PayEx respectively. These two services are launched in a small scale in some Swedish towns 2009 and 2010. PayEx mobil is based on a mobile wallet using a pre-paid account whereas the Payair concept is based on usage of the credit card or bank accounts of the end-users. The payment services are both based on specific security solutions using two way connections to a security server, no SIM-cards or operators are involved, see more (Markendahl, 2011).

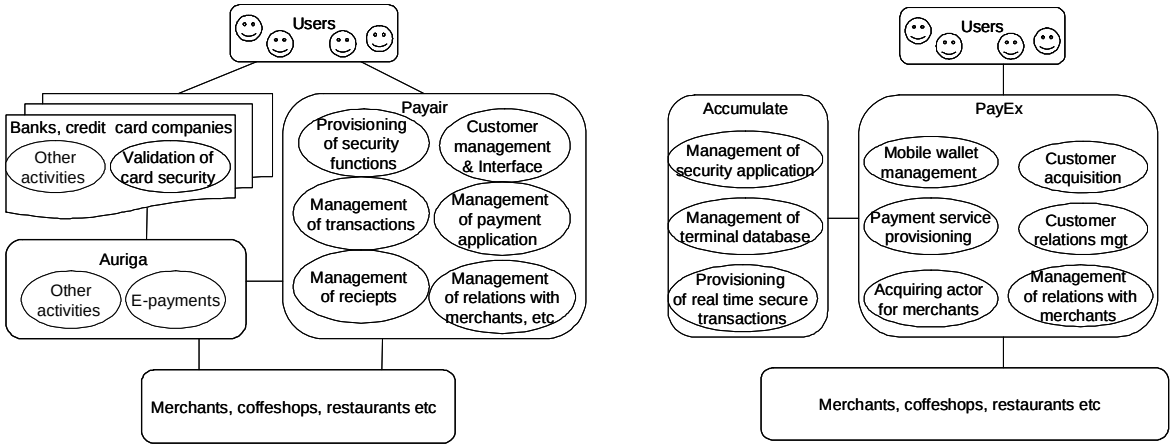

Figure 5.2 Distribution of activities among actors for new mobile payment services, to the left: the Payair concept, to the right: PayEx mobil

Figure 5.1 and 5.2 illustrate that the activities can be distributed among actors in a multitude of ways. This distribution of activities, and roles and responsibilities, is not outlined by the technical standard. It is a result of negotiations and agreements among actors for each special case. The SMS payment examples in Figure 5.1 are just two among a large number of different ways for interaction between actors. The technical standard provides a foundation and the final formation of eco-system is a result of the actor interaction for a specific service.

Actors and relations

The same variation between different services can be identified when we describe the cases above at an actor level. Figure 5.3 illustrates the relations between actors for these payment services. The different types of distribution of activities and configuration of actor networks are a result of case by base negotiations and agreements for specific services and/or regions or towns.

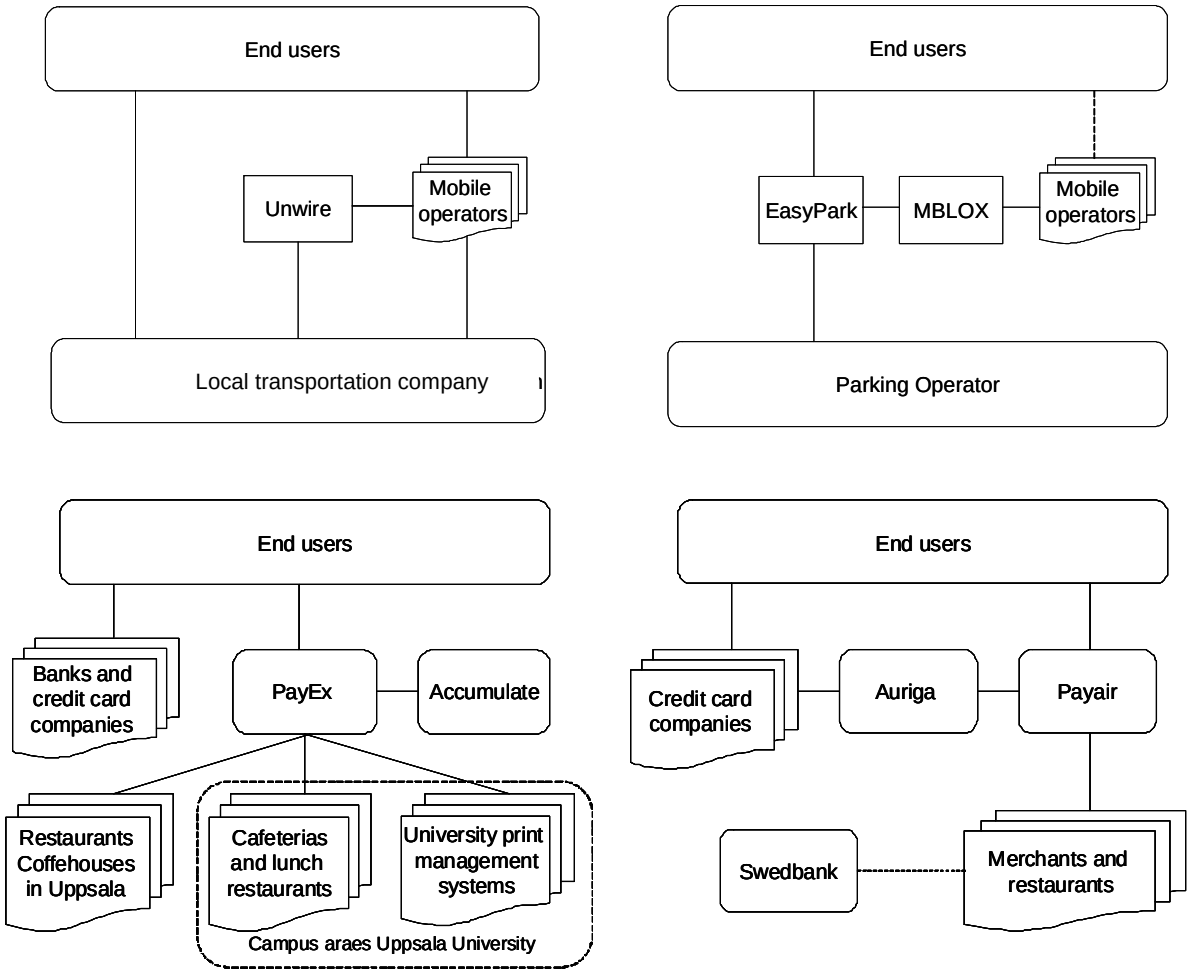

Figure 5.3 Maps of actors and relations from the examples in figure 5.1 and 5.2

For these types of services we can conclude that the main actor that actually provides the mobile payments service is some kind of intermediary actor, it is not the mobile operator, a bank or a credit card company.

In the SMS payment cases the operators are slightly involved but for the PayAir and PayEx cases the operators are not involved at all. For the Payair solution the financial institutions are involved mainly through the end-users, the solution is based on the use of the existing bank or credit card account of the end-users.

It can be interesting to know that the Payair security solution is a key component in the recently (February 2011) presented Ericsson Money Service. According to the press release by Ericsson this service will be offered to mobile operators in countries with many “unbanked” mobile customers. At the local market the operators can cooperate with merchants in order to establish a payment infrastructure based on mobile phones and the phone subscriptions. Hence, mobile operators can enter the payment business.

Actor cooperation for selected payment services in Japan

Similar types of activity and actor maps as presented above are found when we study the mobile and contactless services that have existed in a large scale in Japan for many years. The contactless service “Suica” using plastic cards was initially introduced by JR East for transportation services but could later also be used as *electronic money*, from (Bockish & Alexandro, 2010):

"Commuters could now use their Suica cards to pay in the establishments within the JR East station"

" the most marked growth took place when the card started gaining acceptance outside the stations. As of the end of March 2010, approximately 89,000 shops are Suica member stores and handles approximately 1.74 million transactions per day"

An actor map for the Suica service is shown in figure 5.4. The actors and relations in this figure can be compared to the PayEx case as described in Figure 5.3. The payment solution with an initial intended usage, i.e. for printing services and transport ticketing respectively, found new application areas. In both the PayEx and the Suica cases the usage started in the local environment, i.e. the campus area and the train stations, and was later extended to be used outside these areas.

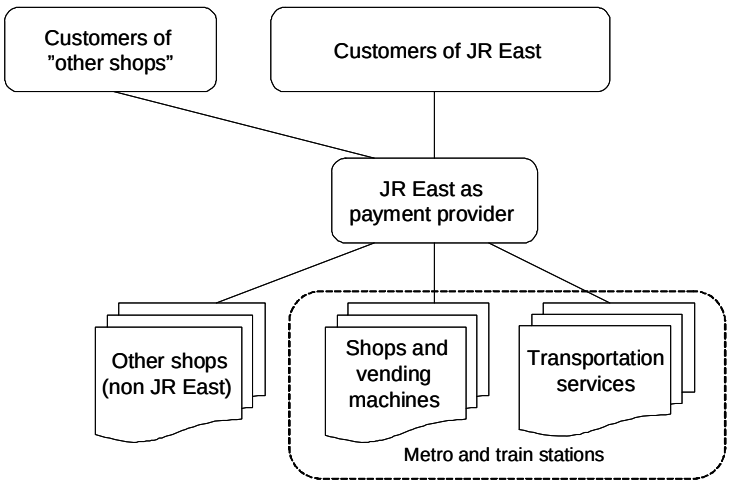

Figure 5.4 Actor map for the Suica payment service provided by JR East

Later on a “Mobile Suica” was introduced and the mobile network operator NTT Docomo launched the mobile wallet service, “Osaifu-Keitai”, in June 2004. Osaifu-Keitai was developed in order replace the physical wallet with a digital one in the mobile phone. The handset is equipped with the FeliCa contactless IC card technology and extended memory to register many different services. Today the service is a de facto standard in Japan for mobile payments and is currently being offered by two other mobile operators, Softbank and KDDI.

It is interesting to follow how NTT Dodomo used the mobile wallet service to enter the payment business ending with the launch of an own credit card brand. The story in summary (from Markendahl, 2011):

In July 2004 JCB and AEON Credit Services presented a payment solution for contactless IC cards, *QUICPay*, compatible with DoCoMo's mobile wallet service. The service enables the customers to do mobile payments without the disadvantage of charging the card or mobile with money beforehand. The mobile expenses are covered by the customers' credit card of choice. In april 2005 DoCoMo founded a strategic alliance with the partners Sumitomo Mitsui Financial Group, Inc. (SMFG), Sumitomo Mitsui Card Co., Ltd. and Sumitomo Mitsui Banking Corporation (SMBC). The objective was to launch a credit-payment service using DoCoMo's mobile wallet phones. DoCoMo acquired 34% of the shares of one of the partners (Sumitomo Mitsui Card). This alliance resulted in the launch of DoCoMo's *iD* credit card brand in December 2005. *iD* enabled companies to link credit cards to DoCoMo wallet phones and thus offer contactless mobile payment services. The knowledge and experience with *iD* in the credit card business enabled NTT DoCoMo to launch its own credit card service *DCMX*, in April 2006. Now NTTDoCoMo had entered the financial service market. Every new customer, purchasing an Osaifu-Keitai phone was automatically enabled as a *iD* customer. In August 2009, *iD* gained over more than 10 million subscribers.

It is interesting to identify the cooperation strategies that were used by NTT Docomo. The position of NTT Docomo was different for the different types of credit card services.

- the *QUICPay* service was offered by other financial institutions
- the *iD* service was offered by NTT Docomo in collaboration with financial actors
- the *DCMX* the credit card brand now makes NTT Docomo a financial institution

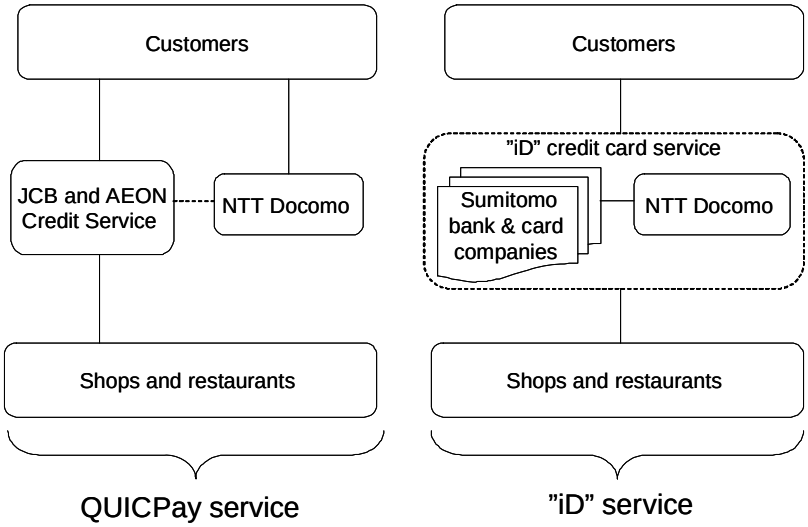

Figure 5.5 Actor map for credit card services where NTT Docomo is one partner

6. Analysis

In the analysis section we aim to answer: why do mobile payments according to the NFC Forum and GSMA eco-systems have difficult to become implemented? We compare different service solutions in terms of what technical and business aspects are defined or not by standards and/or descriptions of eco-systems.

Comparing sections 4 and 5 we can identify a type of “gap” between eco-system descriptions and descriptions of activities, actors and relations for existing services. The eco-system descriptions mostly list actors and possibly roles but do not define what roles and responsibilities different actors should have.

A clear and good description of roles is presented by GSMA and EPC when it comes to service management roles and the interfaces for a TSM to banks and operators. However, this description has a major drawback since it just focuses on SIM card related issues and service management roles for a TSM. The description assumes that the business is already established, nothing is a said about other activities and roles related to the actual business and the relation between consumers and merchants or service providers.

In order to create a working eco-system a number of aspects need to be defined, clarified or agreed. This applies to technical functionality and interfaces for exchange of data as well as distribution of roles and responsibilities among actors. The descriptions by different Forums cover technical functionality (the standard) and to some extent the business related aspects (eco-systems and specification of roles).

However, this is about “how it could be”, actors really need to discuss and agree about how to implement the standard or “policy”. This is illustrated by table 6.1 below where we compare two of the Forum descriptions with two types of existing mobile payments systems described in section 5. We also compare with another type of global policy that turn out to work well; the credit card based system for payments.

The credit card payment services are based on a “policy” that is a mix of technical standards, government/EU directives and agreements among actors. The technical standard covers technical functionality and exchange of data among the actors. The technical standard describes mechanisms for security, authorization, clearing and settlement of payments. The actors are cardholders, merchants, cardholder´s bank, merchant´s bank and companies responsible for the clearing, typically a credit card company. Figure 6.1 describes authorization for credit card payments including the involved actors and their activities. The same types of schemes are defined for clearing and settlement of payments.

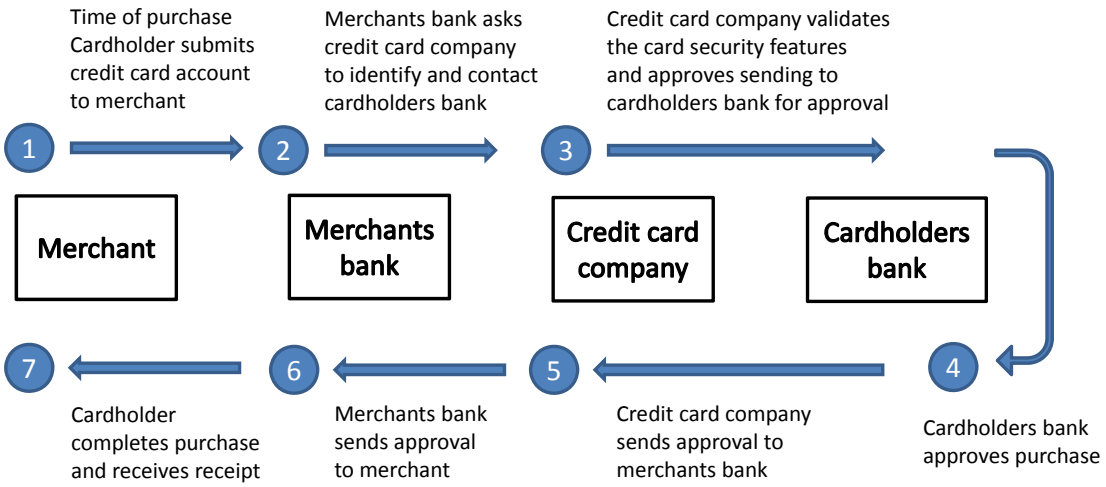

Figure 6.1 Business architecture, activities and data exchange for credit card payments - the authorization part, from Mastercard "Anatomy of a transaction"

An example of government policy is the Single Euro Payments Area (SEPA) initiative. SEPA is a European Commission (EC) and European Payments Council (EPC) initiative that plans to remove the barriers to movement of cross-border electronic Euro payments. In order to implement the credit card payment schemes merchants and service providers need to "connect" to this network, hence the case by case agreements as indicated in table 6.1.

System or type of service solution	Technical functions	Exchange of data	Type of actors	Roles and responsibilities	Distribution of roles
System for credit card payments	Defined in standard	Defined in standard	Defined in standard	Defined in standard	Defined by agreements
Mobile payments by NFC Forum	Defined in standard	Defined in standard	Partly by ecosystem	Not defined	Not defined
Mobile payments by GSMA/EPC	Defined in standard	Defined in standard	Defined in ecosystem	Partly defined by ecosystem	Partly by ecosystem
Mobile payments - SMS ticket cases	Defined in standard	Defined in standard	Defined by agreements	Defined by agreements	Defined by agreements

Table 6.1. Aspects that are defined or not by standards and/or descriptions of ecosystems

The local business networks represented by the SMS payment cases and the Japanese contactless mobile payment services are similar to the credit card cases. There is a technical standard used as a foundation for providing services and to do business. The SMS and Suica cases illustrate how business is done in a local network with a limited number of actors. In all these cases there is a service provider (a transportation company), mobile service providers that actually provides the mobile payment or ticketing services, and finally mobile operators that provide the customer base for the services. In some case the mobile subscription is used for payment but this is not the key issue.

When we look into the mobile payments schemes proposed by NFC Forum, GSMA etc we see that a number of aspects are not defined or agreed. The technical standards are well defined when it comes to technical functionality and how data should be exchanged. For NFC Forum the business aspects are hardly addressed, the ecosystem includes listing of actors but nothing is said about roles of actors or the interaction.

The GSMA standards and eco-system descriptions provide some more information about actors, roles and responsibilities. However, the description of interaction between actors is limited to a minor part of all roles that are needed to describe a complete eco-system. GSMA and EPC provide description of just one role, the one concerned with the life-cycle management of the security and service applications to be stored at the SIM card. Nothing is said about responsibility for providing the service to be paid for, management of customers, business relations or payment streams. In the SMS and Suica cases this is defined by negotiations and agreements among the involved actors.

Another drawback with the GSMA/EPC solution is the assumption that the service will make use of the SIM card. Other solutions may be to store the service application in a memory card, in dedicated hardware or as a software application (e.g. as an "app"). The GSMA/EPC solution with banks, mobile operators and 3rd party TSM can be questioned since mobile payment services can be provided without involvement of any of these actors. This is the motivation for the word "partly" in table 6.1. So the question remains: *"Why do mobile payments according to the NFC Forum and GSMA eco-system descriptions not take off?*

We suggest that there are differences between actors depending on their network position and role (e.g. as operators, banks, retailers or hardware or software suppliers) and also between involved standardization or policy organizations depending on their specific purpose. The way that these organizations represent the business architecture has so far (as shown in Table 6.1) resulted in only partly defined relevant actors, actor roles and responsibilities or distribution of roles and responsibilities. For the existing services s in Table 6.1 the business architecture in those dimensions have been defined in standards or by agreements by local actors. For NFC enabled mobile payments to be realized in line with visions expressed in media by business firms or industry organizations local actors have to develop practices through business network interaction and agreements.

With reference to the ARA model (Håkansson and Snehota, 1995) we can ask if the eco-systems include all important actor categories in a web of actors and all necessary resources in resource constellations that need to be involved for the service innovation process. Some eco-systems represent activity links, actor bonds and resource ties at a generalized dyadic level but are by definition not translated to exchange practice

7. Conclusions

For mobile payments a multitude of technical solutions and interfaces are proposed and an in many cases standardized. The plethora of widely dispersed daily information from actors in different industries, from industry organizations, from consultants and research institutes, widely are mostly about future opportunities, and less frequent, about identifying defining and addressing problems to realize the potentials. There are important network changing forces, with many interconnected actors, activities and resources involved, that are somehow handled by in practice by a variety of actors. However, it seems to be difficult to agree how these solutions can be introduced at the market. From ongoing initiatives we initially identify four main types of business scenarios for the large scale adoption mobile contactless payment services:

1. One large and strong actor like e.g. VISA or MasterCard takes the lead without any establishment of a standard or industry-wide agreement

2. Actors from different sectors develop a solution (potentially without any global standard) and offer a service in order to solve a specific problem, e.g. cash handling

3. Actors within a sector or industry at a market join forces in order to offer common national standard

4. Global organizations specify an agreed standard in both the technical and business domain that serves as a basis for the deployment of the service

The research question in this paper is related to the last type of scenario where many actors agree and produce “big and complex” descriptions of interaction between “many” actors aiming for a global solution and standard. *Can policies or standards describing actor roles and responsibilities for technical innovations like mobile payments remove obstacles for introduction of the innovation?*

By comparing business architectures for existing mobile payment services with the envisaged ecosystem proposed by the global industry organizations we can identify a miss-match between “visions and proposals” and how he actors are organized for “real services”. Although the technical architecture and solution can and need to be standardized in order to enable product development, the business architecture need to be agreed by all involved actors at specific markets where the service will be provided. We claim that contactless mobile payment services will not take of based on specifications of business architectures. Roles and responsibilities need to be negotiated and agreed based on business agreements for each case.

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