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## Mobile payment: a multi-perspective, multi-method research project

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## **Mobile payment: a multi-perspective, multi-method research project**

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### **Introduction**

Mobile phones have become an indispensable part of our lives. With new innovations and advancements in technology, various mobile applications have been introduced, one of which is 'Mobile Payments'. There are several mobile payment solutions on the market today. However, almost none of them have succeeded in achieving mass-market adoption in western societies. Possible explanations can be found in (1) consumer and merchant behavior, (2) technology, (3) the m-payment ecosystem and (4) regulation. Below, we discuss examples from each of these reasons in order to frame research on m-payment (Mas and Rothman, 2008, Dahlberg et al., 2008a, Ondrus et al., 2009, Ondrus and Lyytinen, 2009, Kazan and Damsgaard, 2013, Henningson and Hedlund, 2014).

Behavior- related explanations have to consider that, in developed economies, consumers and merchants have numerous different payment instruments and solutions from which to choose. Over the years, they have developed well-established routines and preferences that are hard to change. There still are significant differences in the use of alternative payment instruments by consumers, such as cash, checks, debit cards, credit cards, money transfer, direct debit, account-based electronic banking payments, etc. (Ausubel, 1991, Snellman et al, 2000, Chakravorti, 2000, Stavins, 2001, Schmalensee, 2002, Chakravorti and McHugh, 2002, Schuh and Stavins, 2006, Dahlberg and Öörni, 2007, Jonker, 2007). The question is whether new technologies will lead to changes in these stable usage patterns.

Technology also plays a core role. Although Short Message Service (SMS)-based payments have been around for a long time, Near Field Communication (NFC), a wireless, short-range communication technology that uses Radio Frequency Identification (RFID) compatible with ISO/IEC 14443 contactless smart cards, promised to lead to a large-scale adoption of mobile payments. However, this far, only dedicated payment solutions for transport systems, parking etc. are widely used (Ondrus et al., 2009, Kazan and Damsgaard, 2013) and, recently, broader NFC-card based payment applications have made inroads in some countries, like Denmark (Mobile Pay) and the Netherlands (NFC card payments as introduced by banks). So far, M-payments are still marginal, however, not only in relation to the total monetary value of payments as a whole, but even in comparison to cash, debit and credit cards. At the same time, mobile devices are used increasingly to make purchases from the web and to access card-based and (bank) account-based payment services. As such, the question that has become relevant are whether new payment technologies and platforms will lead to changes in behavior and towards popular m-payment ecosystems.

Directly related to questions with regard to technology are questions about who is going to provide the necessary technologies and how, but also who will control the relevant resources and assets. The banks, credit card companies and telecom operators have competed for the control over the core assets in m-payment systems and the entire ecosystem (Au and Kaufman, 2008, Dahlberg et al., 2008b). The secure element (SE) that is functional in user identification and authentication, the

encryption of payment transactions, etc., is one of the key assets. In some countries, banks have been able to expand their business with their security solutions, for example by providing strong identification and authentication service to tax authorities and other government agencies, municipalities, merchants, etc. The position of banks has remained strong, since, in most m-payment services, money is loaded to this service from a user's (bank) account and cleared against the (same bank) account. However, the question is whether changes in control and assets will lead to a change in the ecosystem. For instance, questions like who has the right to collect and use customer data, who is authorized to execute payment transactions and who will control money flows and float are becoming relevant due to the emergence of new Over The Top (OTT) providers as enabled by changes in regulation.

Consequently, regulation plays a core role as well. On one hand, regulation has been promoted in order to stimulate telecom operators to open up their networks to service providers and to stimulate the service market, via the so-called net neutrality regulation. The innovation capabilities of telecom operators have been seriously harmed as a result. As a result, Over The Top (OTT) providers, both technology providers and large Internet platform providers, such as Amazon, Google, Apple, PayPal, Facebook, We Chat, Sagepay and Square, have been able to make inroads into the m-payment ecosystem. On the other hand, the position of banks and other established financial institutions has long been protected by sector-specific finance regulations. Banks and credit/debit card companies are supervised by central banks, to which they also report data about the use of different payment instruments. This is an integral part of the monetary system regulation. There have been some antitrust cases, especially against Visa and MasterCard, with the aim of opening up the payment card markets to other actors (McAndrews and Stafanadis 1999, European Commission 2002, Office of Fair Trading UK 2003). These cases have, however, not challenged the position of banks and established financial institutions within the payment ecosystems.

Although there are several reasons and avenues to explore, in this paper, we focus on the ecosystems aspects, in particular the fact that core players in the ecosystem in mobile payments market belong to different industries, and each has different interests, as we found in our previous study on mobile payment platforms (De Reuver et al., 2014). Therefore, in this paper, we present research into stakeholder preferences, using multiple research methods and multiple foci. We discuss five studies that provide insight into:

1. Consumer behaviour, based on a consumer survey (2012)
2. Merchant acceptance, specifically in the hospitality industry, based on a survey and conjoint analysis (2014)
3. Merchant acceptance, based on a Q-sort survey (2014-2015)
4. Stakeholders and expert opinions, based on Analytical Hierarchy Processing (2014)
5. Expert opinions, based on mobile platforms and ecosystems approach (2014)

The common question that drives these studies is *how we can explain the fact that mobile payment platforms are not established (yet) in modern Western economies, and to what extent are the preferences of stakeholders in the ecosystem not aligned?*

To answer these questions, we bundled a number of studies. We begin by reporting on a consumer survey that was carried out in 2012.

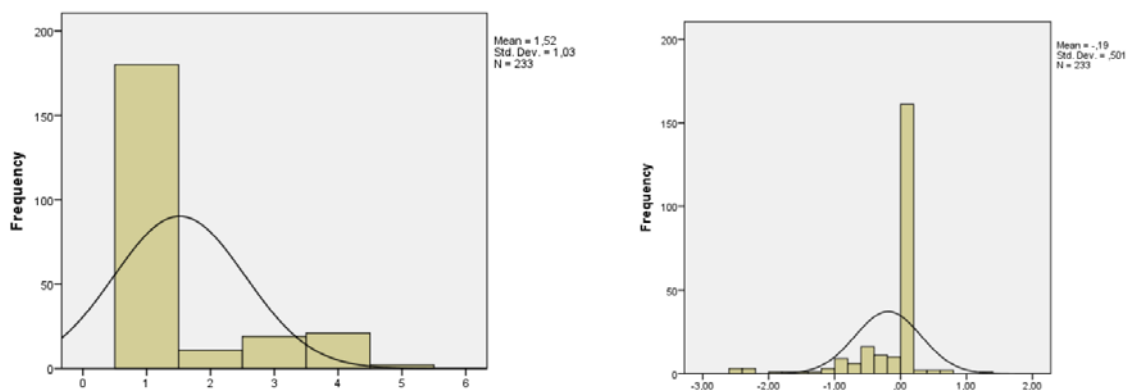
To answer our research question, we briefly discuss several studies.

## Study 1: Consumer survey

**Approach and methodology.** In an annual study on mobile services, a representative panel of 20,000 households was used to sample respondents, including questions regarding m-payment and collected log data. The user panel, which is representative of the Dutch population in demographic terms, is regularly renewed through active recruitment (i.e. no self-selection bias is involved), while panellists are typically not compensated for taking part in surveys. The first selection questionnaire yielded 1653 potential respondents. Although 519 respondents initially indicated that they were willing to participate in the study, only 369 downloaded and installed the app, while only 233 participated in the study for the full four weeks. The reasons given for dropping out during the study were related to technical problems, like battery drainage and reduced performance of the phone. Some respondents dropped out because they upgraded to a new version of their operating system. On average, the participants were 46 years old, while 52% was of the male gender. More highly-educated respondents were overrepresented (61% in the sample versus 28% in the total population). The distribution according to position in household, participation in labour market, family size and income was quite a close approximation to the population parameters.

The software logged each action of the user over a period of 28 days (30 October – 27 November 2012). Each time an application is launched, the software logs the application name, date and time, and the duration that it is displayed on the foreground of the device.

**Results.** The **Consumer research** shows that mobile payment usage is very limited: only 10% of Dutch consumers have looked into the possibility of using mobile payments, while only 1% uses mobile payments on a regular basis (N = 1653), which means that mobile payments still have a long way to go. Of the respondents, 83% never used mobile payment options at all. The log data (see figure 1) shows that 35% of the users (N =233) launched a financial or payment application at least once within the four week period. On average, active users launched m-payment only eight times. Active users on average only launched a session once a day. In addition face time per day per active user in minutes was very limited (on average less than a minute per day). Typically, the link to a financial or payment app was started directly from a search page, after which the user clicked to commerce apps, specific processes, news and information websites, or returned to an idle status.



**Figure 1** Small m-payments frequency and log transformation of minutes spend on finance apps.

Generally speaking, based on our survey and on log data, we have to conclude that mobile payments were not used intensively in the fall of 2012.

In the survey, we also asked the respondents included in the log-data study (N = 233) if they would be willing to use their smartphone for m-payments, to which 51% gave a positive response, while 28% preferred mobile phones over credit or debit cards, and 37% felt that the risks to be too big. This would suggest that there is a potential market for m-payments.

Having said that, we seriously doubt that if the situation has changed dramatically, the main reason being that efforts to develop a common platform to introduce m-payment by MNOs and banks have failed (De Reuver et al., forthcoming), although marketing research suggests that there has been a growth of about 4% in the first two quarters of 2015. A more qualitative analysis of the findings shows that mobile payments are rarely considered as an alternative to existing payment systems, and only add value when combined with loyalty cards.

## **Study 2: Merchant study.**

**Approach and methodology.** In the first merchant study, we used Q-sort to detect specific merchant groups, i.e. mainly small retailers, and identify which factors influence the adoption of NFC m-payment. Q-methodology (hereafter referred to as 'Q') is a research method that has its origins in psychology and is designed to study subjectivity. It is most often used when researchers want to study attitudes towards a phenomena, and it does this through a process known as the 'Q-sort' (Cross, 2005), in a process that requires participants to rank a number of statements on a quasi-normal grid. By ranking statements in relation to one another, the participant is forced to think about issues in a holistic manner instead of separately (Akhtar-Danesh, Baumann, & Cordingley, 2008). These rankings are then subjected to correlational and factor-analytical techniques. Factorization reveals patterns of perspectives, by identifying groups of participants who have similar Q-sorts, i.e. who have expressed similar opinions. The focus of Q is on subjectivity, as it examines the dimensions of phenomena from the participant's personal/intrinsic perspective, using statistics to identify differences and similarities among participants (Dennis, 1986). Based on an extensive literature review, we used 24 statements related to technological factors, like the availability of NFC-enabled mobile phones, NFC-enabled POS equipment, security, etc.; ecosystem related topics, like the parties involved, competitor behaviour, the role of government role, etc., as well as same-side and cross-side platform effects; organizational implementation issues, like the budget available for investments, support, management support etc., as well as ease of use for employees; and expected outcomes, like enhanced customer services, reduced transaction costs, new loyalty programs, etc.. Data was collected from 37 respondents operating in the retail industry. We also collected clarifying statements from merchants while they were filling out the Q-sort. The data was collected via FlashQ software and web access.

**Results.** The study shows that ease of use and a critical mass of (new) users are crucial to the largest group of merchants from the sample (51%). Cross-subsidization is an important mechanism for a small group of merchants (5%) to make investment in new technologies possible. Merchants need a budget to implement the system. A third small group of merchants (5%) is concerned about the availability of NFC-enabled smartphones, as well as security, reliability and privacy. The last category of merchants (24%) share the concern of availability of NFC-enabled smartphones, but are more interested in the increased efficiency of the POS. This latter group has a strong preference for

existing and accepted payment methods. Generally speaking, the results suggest that one of the major problems facing merchants is the support they need in implementing m-payment systems.

### **Study 3: Merchant study Hospitality industry**

**Approach and methodology.** The second **merchant** study, which focused on the practical implementation in a specific industry, used conjoint analysis to examine very practical usage criteria. Conjoint measurement (Vriens, 1995; Molin, 1999) is a technique that is traditionally used to identify preferences in a multi-attribute decision-making space. Conjoint analysis (Gustafsson, et al., 2003), also known as factorial survey and vignette studies (Rossi and Anderson, 1982), offers a valuable alternative, because it integrates the strict factorial design and the concept of attribute orthogonality (Louviere, 1988), and because it can be applied in studies examining the future use of information technology (Van de Wijngaert, 1999; Bouwman and Van de Wijngaert, 2002, 2003). Respondents are presented with fictional cases, also known as conjoints. The cases vary by systematically changing aspects like usage of pin in relation to amount spent during the transaction, the device being used (smartphone of client or merchant device), printing of receipt, and the provision of a common service by all the banks. As dependent variables, in addition to the attractiveness of the application, ease of use and safety (all scored on a 7 point scale), costs, which are a key factor for the merchants (from free to € 1200 per merchant), are considered. Forty SMEs in the hospitality industry filled out a questionnaire containing the conjoints. Only five merchants already had a kind of mobile payment system in place (Minitix, NFC payment), while they all support traditional cash and debit cards, and 75% accept credit cards.

**Results.** Generally speaking, the merchants are fairly neutral with regard to the attractiveness and ease of use of the mobile payment solution on offer, and relatively positive about the safety of such a solution (4.2 on a 7 point scale). The conditions are that only one common (universal) systems should be in place, a pin should be used, on the merchant's device, and it should be possible to print a receipt. However, the models that have been tested show a low explained variance, suggesting a rather high level of heterogeneity in preferences among the involved merchants. Also, correlation with attributes of the merchants, like innovativeness, number of clients and type of clients is not significant.

### **Study 4: Ecosystem stakeholder study**

**Approach and methodology.** In this study, we use Analytical Hierarchical Process, a multi-criteria decision-making method (Saaty, 1980), to examine how **experts and stakeholders** in the ecosystem, other than consumers and small merchants, ecosystemsee technological, strategic, economical and organizational criteria playing a role in the preference for specific m-payment platforms. The platforms under study are the platforms we discussed so far, e.g. bank and/or telco led NFC platforms. What is new is the attention to platforms of Over The Top Providers, like Google Wallet, Apple Pay, PayPal, Amazon payments or AliPay, or platforms that are merchant-led, for example closed loop solutions from MCX (Merchant Customer Exchange) by major US retailers, or the Starbucks payment platform, that use, for instance, QRC-based solutions. Based on platform theory and ecosystem thinking, we focus on topics like network openness, selection of partners (input control), governances for organizational related topics. From a technology perspective, we examine the location of the Secure Element, the technical openness of the platform, and ease of use.

Strategically, the focus is on product differentiation and universality, as well as on market power. From an economic point of view, costs, a critical mass of users, market acceptance and customer ownership all play a role.

AHP, which has been widely used in weighing user requirements and preferences in many studies, is based on a hierarchy of preferences or criteria. AHP analysis often involves a small group of experts who are able to perform subjective pair-wise comparisons of decision criteria (Pynnönen & Hallikas, 2006). It is assumed that the model being researched can be expressed completely in a hierarchical structure showing the relationships of the goal, objectives (criteria) and alternatives. The data collected from respondents is a list of pair-wise comparisons regarding the relative importance of each criterion. Using the AHP methodology allows us to determine the degree of preference of one factor over another with respect to each criterion. The respondents express their opinion on a numerical scale, whereby every number can be associated with the importance level of one factor over the other. We used Survey Gizmo to collect data from a convenience sample of 45 respondents from the banking industry (12), MNOs (8), large retailers (7), academics and experts (11), and others (7), all of whom have been involved m-payment projects in the Netherlands and are highly experienced: 80% have been involved for more than 3 years (44% for more than 7 years). After consistency checks, only 33 datasets were analysed. In the discussion of the result in this paper, we also excluded experts and academics, leaving a total of 22 responses.

**Results.** The analysis shows that economic and strategic aspects were more relevant to understanding what kind of m-payment platform is attractive than organizational or technical aspects. At a secondary level (see figure 2), market power and the possibility to differentiate products are clearly important criteria, followed by market acceptance, number of customers, and universality of the platform. Generally speaking, the preferences of banks, telecom operators and merchants are largely similar, and it is only with regard to product differentiation that telecom operators can be differentiated from banks and retailers. The preferred platform is an NFC platform led by banks and telco's (56%), followed by merchants platforms (27%), while OTT platforms are the least preferred (18%).

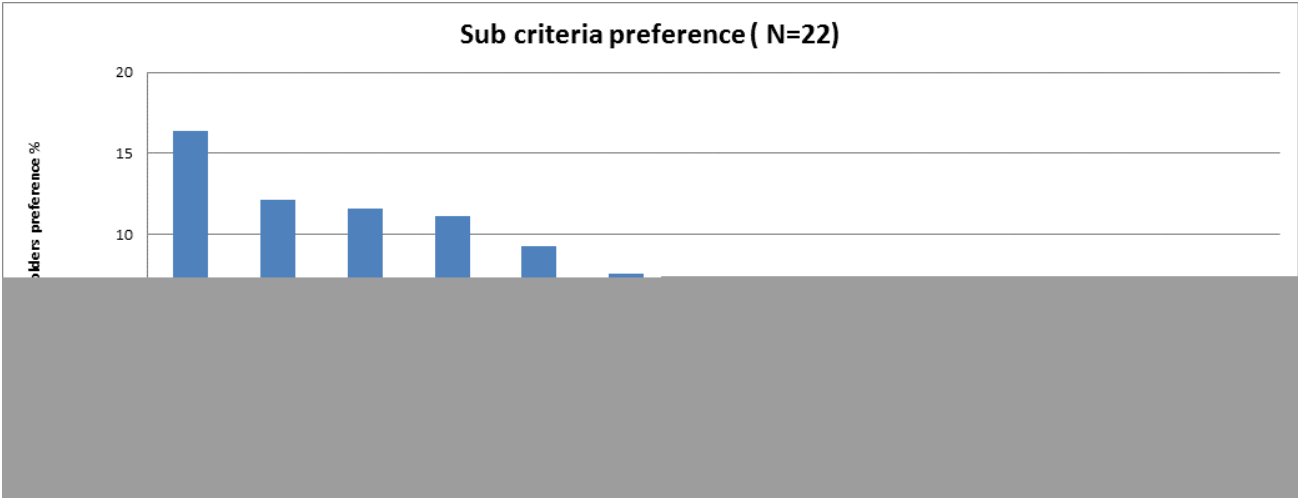


Figure 2 Sub criteria preference

Issues like location of SE or platform compatibility are considered to be less relevant. As such, banks and financial organizations have a distinct preference for competitive advantage, by partnering up with influential actors, while having a large installed customer base and platform promotion are also crucial to them. Telecom operators benefit strategically by differentiating their platform or adding new services to attract more customers. Large retailers want to partner up with big players and also maintain control of the customer information to influence the shopping behaviour of their customers.

## Study 5

**Approach and methodology.** The last study (study 5) focused on the design requirements of a mobile payment platform, with a specific focus on Secure Elements, which come in different versions and are supported by different actors. For instance, there are removable or embedded secure memory cards or stickers. These are proven technologies as SIM/Universal Integrated Circuit Cards UICC or micro SD, and are, for instance, provided by Vodafone, Cityzi, Valyou/Telenor, Softcard/AT&T, Verizon, T-Mobile and Tapit from Swisscom. There are also SEs controlled solutions as used by OTT providers like Apple Pay, Google Wallet or Samsung. Finally, there are cloud-based solutions, for instance supported by VISA or MasterCard/FMCX on the condition that these solutions are certified. These platforms and the solution for SE are evaluated by stakeholders, specifically banks, MNOs, Trusted Security Managers and Technology providers. In addition to the interest in the position of the SE, other aspects were also subject of a questionnaire that was distributed internationally among stakeholders. For the 420 Invitations were sent out, the response rate was 12%, half from the Netherlands. Although clearly a convenience sample, the data still provide some interesting insights.

**Results.** User experience (65% strongly agree) and security (66%) are extremely important and almost conditional criteria for users, while a positive business case (62% positive answer), short time to market (43% positive) and viability of the m-payment solution for a service provider (51% positive) should be evident.

Generally speaking, respondents express the opinion that the m-payment solution should be combined with loyalty cards, openness towards third parties and certification by third parties (product differentiation). A unified solution for all, controlled by a single provider, leads to opposite views, while there clearly is no common opinion on unification (Common Universal system). Certification by established parties, like VISA, MasterCard, etc., on the other hand, is highly relevant. The same applies to common standards and availability via different mobile phones or OS. Also, the positioning of the SE on the device or in the cloud leads to opposite or neutral views. as carrier, while the use of a PIN for verification is favoured by a majority.

## Cross study comparison

Although we used different methods and perspectives, i.e. consumer, merchant, banks and telco's as well as other stakeholders (table 1), the core factors are more or less the same. The joint offering of m-payment platforms, broad market acceptance and critical mass of users are considered to be relevant factors for the acceptance of mobile payment by customers and merchants. Although there is a great interest from the user side for the m-payment platform, the main issues are related to the lack of strategic collaboration among traditional key players that therefore create space for OTT providers to fill the gap. Although most respondents in the latter two studies do not appear to be in



favour of this option and favour a unified solution offered by banks and telco's, respondents realize that they have to deal with the possible alternative. Technical issues are considered to be instrumental and manageable.

**Table 1** Summary of studies

	Method	Population	Core factors being addressed
Study 1	Survey	Consumers	Current usage Willingness to use Alternative payment systems
Study 2	Q-sort	Merchants	Ease of use Critical Mass Organizational Implementation Alternative payment systems
Study 3	Conjoint	Merchants	Common (Universal) system Platform Openness Security (Pin verification)
Study 4	AHP	Banks, MNOs, Retailers	Market power of provider Product differentiation Market acceptance Critical mass of users Common (Universal) system Platform Openness Control over customer information
Study 5	Survey	Banks, MNOs, Tech providers	User experience Security (Pin verification) Positive business case Common (Universal) system Platform Openness Product differentiation

In similar research in China, we found the same factors for banks (Guo, Nikou & Bouwman, 2013), and merchants (Guo & Bouwman, Forthcoming), and we are in the process of looking into the behaviour of a third party provider.

## Discussion

The five studies discussed above all look at different aspects, but implicitly address a common issue, the role of platforms and ecosystems in developing m-payment services. Platforms make it possible to meet diverse user requirements and fulfill user needs. They enable two-sided or multisided markets (Ballon, 2009; Evans et al., 2006; Rochet & Tirole, 2003), for example access to two or more customers groups and/or the creation of positive network effects. Moreover, platforms are intermediaries that match activities and needs of different groups (= sides). In the case of m-payment, the payment platform mediates between banks, consumers, merchants, application developers and, possibly, advertisers. Within multi-sided markets, costs and revenues are generated for different market stakeholders, because a platform has distinct groups of providers and users. The platform pays costs and collects revenues while serving these multiple sides and each individual participant. To succeed, the platform needs to make all sides better off, for example by reducing

transaction costs, and it needs to collect revenues from each side, although one side could be subsidized to increase the total value creation throughout the platform.

By mediating interactions, platforms create network effects. Network effects arise when the core products depends on complementors (Schilling, 2009). Network effects are typical for platforms, since the value of a platform depends on the number of consumers and/or the number of services offered by other agents. In the context of an m-payment service, the number of consumers is highly dependent on the number of merchants using the service, and vice versa. The value of a platform grows when it matches demands from both sides. The challenge in multi-sided platforms, like m-payment platforms, is to achieve a critical mass of users on each side of the platform, making it valuable to the other side (De Reuver et al., in press).

Such a platform has to be enabled by an ecosystem with common strategic interests. Hardware manufacturers, service providers, end-user service providers, merchants, consumers typically act in the key roles within the m-payment ecosystems (Gaur & Ondrus, 2012). Hardware manufacturers include chipset, card and hardware providers. Service providers typically offer intermediate solutions. Banks, mobile telecom operators and OTT players, like Apple and Google, as well as the providers of service schemes, make up the end-user service providers. Merchants sell goods and services and receive payments in return. Consumers also include organizations that represent and lobby consumer interests. States, central banks and regulators are important players that intervene in the ecosystem by setting boundaries within which the ecosystem is able to operate. In the context of (m-) payments regulation typically focuses on security and trust as well as on securing the stability of the monetary system and money flows.

The latter implies that insight into the role of money in general and their implications for m-payment needs attention ( Dahlberg et al, 2015), specifically the bartering nature that is found in Bitcoins, (neo-)chartalist or state theory of money (and the banking crises), or the credit theory of money (which, for instance, Apple's Pay tries to mimic). In the same grain, the role of regulation, like net neutrality regulation and regulation with banking licenses, and the role of disruptive technologies, like cloud SE, offer opportunities to OTT providers, will become the new 'banking system'. Platform providers with millions of apps have the opportunity to extend their platforms by proposing their own, easy to use, m-payment systems (e.g. Apple Pay and Google Wallet) and in doing so make inroads into the traditional payment market by exploiting their data on user behavior and preferences. This is a very strong value proposition if these OTT providers are at the same time able to offer cost savings and guarantee security to the payment ecosystem. To take this a step further, the question becomes whether data will not prove to be the currency of the future.

This paper is not without limitations. First of all, it is based on a blend of small-scale research project that are all organized around platforms, ecosystems and business models related to m-payment from a different perspective. Furthermore, the studies we examined involve projects in the Netherlands as well as projects in China. Although, we see some similar patterns the external validity is limited. In comparison to other studies with regard to m-payment platforms and ecosystems this paper doesn't limit itself to case studies but also includes other research approaches and methods. It is clear that m-payment is an interesting application domain for platform and ecosystem studies and how disruptive technologies and regulation affect both.

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