Inf Syst E-Bus Manage (2009) 7:347–361
DOI 10.1007/s10257-008-0093-1

ORIGINAL ARTICLE

Near field communication: an assessment for future payment systems

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Published online: 17 June 2008

Abstract In this paper, we present an assessment of near field communication (NFC) in the context of a payment market. During these past years, we have been witnessing a number of mobile payment trials based on NFC. Early experiences are already quite encouraging and many expect NFC to become a highly efficient and effective technology for mobile payments. The objective of our research is to evaluate in a systematic manner the potential of NFC as an upcoming technology for mobile payments. In order to ensure the rigor of our research, we used a formal and structured approach based on multi-actor multi-criteria methods. Our research provides one of the first assessment of NFC and a realistic picture of the current Swiss situation as we involved numerous mobile payment experts. Our findings show that Swiss industry experts are quite enthusiastic about the future of NFC.

Keywords NFC · Mobile payments · Market analysis · Technology foresight

A previous version of this paper was presented at the 6th international conference on mobile business, 2007. "Jan Ondrus, Yves Pigneur, An assessment of NFC for Future Payment Systems, Proceedings, Sixth International Conference on Mobile Business, 8–11 July 2007, IEEE Computer Society, ISBN 0-7695-2803-1."

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1 Introduction

Mobile payment trials have got more attention from the industry and the media lately. This growing enthusiasm can be explained by the imminent launch of commercial mobile phones equipped with NFC chipsets. These phones are expected to revolutionize the mobile proximity services such as mobile payments, couponing, and ticketing. NFC brings some new capabilities to mobile phones such as easier device-to-device communication, reading of other contactless chips [radio frequency identification (RFID)], and emulation of contactless cards. NFC is considered to be a great facilitator for proximity interactions between different devices. Seen from a technological point of view, NFC is the fusion of the contactless smartcard and the mobile phone.

One of the main reasons of the hype around NFC is that we have witnessed some great success in the contactless smartcard area. In Asia, there are several thriving contactless schemes deployed. According to previous experiences, the contactless technology used has shown to be more efficient than cash for payment transactions (e.g., speed). Futhermore, it has been evaluated to be cheaper and more reliable than standard chip cards, which involves contact between the chip and the reader. In the long term usage, this contact could damage the reader (e.g., dust, grease). Therefore, contactless schemes were successfully deployed in quick-service and transaction intensive industries such as public transportation.

In Japan, South Korea, and other Asian countries, the migration from contactless cards to mobile phones has already started (e.g., Mobile Suica and Edy in Japan, Moneta in South Korea, Octopus in Hong Kong). Mobile phones can be used for making purchases of any goods at convenient stores and payments of transit fares inside public transportation systems. Recent numbers show that NTT DoCoMo is quite successful with the launch of the "osaifu-keitai" (mobile wallet function). In fact, in about 1 year, 20 million of their subscribers have been equipped with this feature and 2.6 million have already activated the credit card functionality (Balaban 2007). There are 100,000 readers installed in Japan and this number is expected to have reached 150,000 by the end of March 2007 (Parmelee 2007). Even if these numbers are reflecting success, there are still cases of disappointment such as the slow uptake of the Mobile Suica scheme. It was announced to become a successful service. In early 2007, about a year after its launch, there were about 350,000 customers (on the 19 million commuters) who registered to this mobile service, only a third of the prediction made by the rail operator (Balaban 2007). The reason given is the complicated membership enrollment process. Even though e-wallet schemes on cards or mobile phones are well used, there are still some important issues. The number of point-of-sale (POS) is judged as too low. The current interoperability problem between the different schemes is hindering the uptake of a standard contactless application in Japan. In fact, the payment terminals are not compliant with international standards bodies, but rely on bilateral agreements between the different players (Balaban 2007). This shows that a standardization of the NFC technology and the application layer is much needed in order to ease interoperability and therefore adoption on the consumer and the merchant side.

In Europe and North America, the development of mobile payments has not been as successful, with the exception of several countries including Austria, Spain, Croatia, and the Scandinavian countries (Taga et al. 2004). One major difference of the mobile payment services initiated in Asia, Europe, and the US markets is the technology deployed. In contrast with Asia and its RFID technology, in Europe and the US, mobile payment systems are still mostly based on [short message service (SMS)], [unstructured supplementary service data (USSD)], [wireless application protocol (WAP)], or [interactive voice response (IVR)]. This was done in order to facilitate the uptake of mobile payments by using the existing technologies installed in the current customer base. Now that NFC is being standardized for contactless communication, there is hope that the interoperability issues encountered in Japan will not affect the roll-out of NFC schemes through Europe and the US.

Despite the encouraging experiences in Asia, there are still uncertainties around NFC. There have been many technologies with great promises that later became disappointments (Martino 2003). Hype usually came from the general media or other rather unreliable sources. As a result, industry people's opinion on technology is regularly misled and could engender unjustifiable preferences. Too often, these perceptions do not depend on any rational analysis. Therefore, beside the unconditional supporters of NFC, many dubitative industry players are wondering if NFC will be the next winning technology for payment systems.

Various applications in several industries (e.g., retail, logistics, and transportation) could be developed to take advantage of the interaction between RFID tags and mobile phones. Of course, this will depend on the interoperability of the standards used in different industries. Access control scheme based on NFC also seems to be quite popular. As a result, mobile phones could reinforce their position as a multi-function device. Furthermore, NFC facilitates communication between various devices (e.g., business card exchange, driver configuration) which could greatly contribute to the diffusion of mobile computing. Even though these applications seem promising for NFC, they will not be analyzed in our paper as our research only focuses on NFC in the payment context.

As we stated, most hype around upcoming technology does not rely on any formal analyses. Therefore, our research objective is to assess and evaluate the potential of NFC compared to other existing mobile payment technologies in a rigorous and structured manner. As research approach, we used a systematic procedure based on multi-actor multi-criteria methods. In order to ensure the relevance, we involved a group of key Swiss experts from different industries. This research has been done in two phases. For the first phase, we assessed the current payment technologies. Then, the second phase consisted of evaluating the potential impact of NFC in the current mobile payment market in Switzerland.

In the next section, we review previous related work on mobile payment and technology foresight. Then, we clarify several methodological aspects and introduce the multi-actor multi-criteria approach. In Section 4, we present the first phase with the assessment of current technologies. Section 5 describes the evaluation of NFC and the operation mode for this foresight activity. Finally, based on the results obtained, we discuss the general impact NFC might have in the future. We also provide some conclusions and possible further research.

2 Related work

First, we describe the mobile payment research that is related to our objective. Second, we explain the reason why we think that mobile payment and more particularly NFC could be considered as disruptive innovations. Third, we justify the reason why we use a multi-criteria (MCDM) technique for this technology foresight activity.

According to a recent literature review of mobile payment research done by Dahlberg et al. (2008), most of the papers published covered technical issues (e.g., security, protocols, systems architectures) and consumer-centric study (e.g., adoption). This rather limited scope could be partly explained by the recent emergence of mobile payment research. We can expect to see more diversity coming the next years as research in this domain is maturing.

Looking closer at mobile payment research, there are only few papers evaluating the potential of NFC (Chen and Adams 2004; Valcourt et al. 2005; Zmijewska 2005). Moreover, the evaluation is limited due to the descriptive approach of the research. Therefore, there is a real need to rigorously analyzed NFC using first hand data and applying stronger analytical models.

As we mentioned earlier, the consumer aspect has been well investigated. However, the other sides of the market (i.e., providers and merchants) seem to need more attention from the research community. Studying two-sided markets, such as electronic payment systems (Evans and Schmalensee 2005), from a stakeholders perspective is appropriate to get a better comprehension of the diffusion process (Oh et al. 2006).

In light of the many past mobile payment system failures, there is a real need to analyze and understand what requirements are needed to succeed on this market ruled by uncertainty. In fact, the technological trends are hard to predict as mobile technologies tend to behave as disruptive technologies (Funk 2004).

Interestingly enough, mobile payments services are currently underperforming. They are already deployed in niche markets (i.e., digital content, ticketing, vending machines). The research and development investments will probably improve the current performance of the mobile phones as payment devices. We already see that some technologies (e.g., RFID, NFC) are bringing better performance (e.g., speed) than traditional payment cards. As mobile phones might first cohabit and then replace the cards, analyzing the current mobile payment market with the disruption theory seems appropriate.

Technology assessment and foresight are complex activities to study disruptive innovations. There are a relatively high number of parameters to consider in order to get a complete picture of the market. By definition, multi-criteria analysis is a good candidate method to deal with this type of complex problem. MCDM methods imply a modeling activity, which should clarify many aspects, making the decision process more transparent. Following this idea, Salo et al. (2003) have suggested the use of MCDM methods for technology foresight and concluded that there is potential "in terms of lending rigor and transparency to foresight process".

By looking at related work, we established a certain number of issues that need to be tackled and selected several theories to conduct our research. In summary, it

seems that there is a lack of research studying the disruptive potential of mobile payment technologies using the supply-side point of view. To the best of our knowledge, there are few research papers on NFC. Furthermore, most of the research done on NFC focus on the technological and customer adoption aspects.

3 Methodology

As explained above, we selected the use of a multi-actor multi-criteria approach to conduct our research. This approach involves a structured process in order to build the MCDM model. Salo et al. (2003) proposed a process for the use of multi-criteria methods for technology foresight with the "multi-stakeholder" feature:

1. Identification of stakeholders
2. Development of goals, criteria, and alternatives
3. Model development
4. Score elicitation
5. Weight elicitation
6. Computation of overall performance measures

This general MCDM-based process is described in this section. Since this approach has been applied and adapted in two different phases, more description of the specific settings will be given further in the text (Sects. 4 and 5).

First, we need to select the relevant stakeholders we want to include in our study. Furthermore, in order to have a multi-perspective analysis, we chose actors from different industries. Our objective was to select all the major companies dealing with mobile payment issues in Switzerland. We first started by the most active and visible companies. Then, in these companies, we needed to find and contact the key experts and decision-makers that are involved in the payment area. These experts were supposed to be the people who will greatly influence the future of mobile payments in Switzerland. These experts were senior leaders of the mobile payment projects in their respective companies. After a first meeting, most of the experts suggested other companies and experts who would be interested in our research. As a result, we were fortunate to gather a relevant group of experts which represented well the current Swiss market. Moreover, it has been confirmed by several experts that we reached a rather exhaustive group of experts evolving in the Swiss mobile payment area. We included more financial institutions as they are active and usually impossible to circumvent for payment services. Table 1 summarizes the companies and industries selected for our research. More information about the respondents can be found in (Ondrus 2007).

Second, we have to select the goals, criteria, and alternatives. This step was done by screening the existing literature and discussing in a focus group composed of academics. Before starting the development of the model, a pre-validation of the alternatives and several criteria has been done with several mobile payment industry experts.

Third, to develop our models, we primarily adopt the MCDM method ELECTRE I (Benayoun et al. 1966), initially designed for decision-making. In addition, we use

Table 1 The selected companies which participated to the research

Financial institutions	Mobile telcos	Retailers
Credit Suisse	Orange	Coop
Corner Bank	Sunrise (TDC)	Migros
Datatrans	Swisscom Mobile	McDonald's
PostFinance		MyOne
Telekurs multipay/card		
UBS		
Viseca/Aduno		

Technology providers	Public transportation
Crealogix	SBB (National Railways)
link-u	TL (City of Lausanne)
Polyright (Kudelski group)	ZVV (Canton of Zurich)

a group decision extension proposed by Bui and Jarke (1984). The role of this extension is to capture the individual preferences of the experts and the potentially existing consensus between them. In our case, the rationale behind using an MCDM method was obviously not for decision-making but for technology assessment and foresight. The data collected to build the ELECTRE I models are compatible with another simple MCDM method, weighted sum model (WSM) (Fishburn 1967). This method complements well the outcome of ELECTRE I by producing a ranking of the alternatives.

Combining the two MCDM methods gives us two different perspectives on the data collected. ELECTRE I generates outranking relations, which help us to compare two alternatives at a time. WSM creates a global ranking of the technologies. Since the data collected are quite rich, we also explored them using some data cross-analysis techniques. The complete description of all the algorithms used for this analysis can be found in Ondrus and Pigneur (2006).

In order to conduct a technology foresight process (Fig. 1), we need to first establish the current situation by including exclusively existing alternatives. Then, we introduce future possible alternatives and observe their impact in the previously established model. In other words, we need two distinctive phases, one for the present and another for the future. The first model should represent the current situation of the market, which representational fidelity could be validated by experts. While the second model represents a more speculative situation, which could only be legitimized with the existing assumption of the experts.

Forth and fifth, we have to contact and meet the experts in order to collect the data (i.e., elicitation of the scores and weights). One of the originality of our approach is the use of independent sets of criteria to evaluate the alternatives. Each company has to select its own criteria, as each industry has its specific priority and not all the criteria previously selected are relevant from them. The weights are also

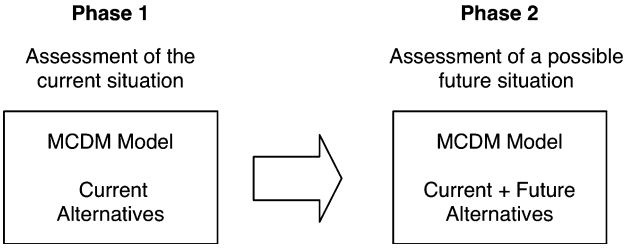

Fig. 1 A foresight activity process using MCDM methods

decided by the experts themselves. In a traditional MCDM procedure, the criteria and weight are decided in advance by a limited number of people. The experts only give their evaluation of the proposed alternatives. In our case, this traditional approach did not seem to be compatible because of the constraints of our research settings (e.g., time allowed by the experts).

The data collection process is not an easy task when using a MCDM approach. There is a large amount of data to collect in a short period of time. This process could rapidly become tedious. Therefore, an original way to collect data had to be found. In addition, the computation and visualization of the results is also not easy to perform. For these reasons, we developed an integrated tool, PylaDESS.

The collection of the data is done following the "Pack of Cards" technique proposed by Simos (1990) and later improved by Pictet and Bollinger (2003). The idea is to give to the expert cards with the name of each criterion inscribed. Then, we asked the expert to manipulate these cards, rank them, inserting blank cards to reinforce ranking differences. This procedure is usually done with a physical card game. To facilitate our data collection, we digitalized and integrated the game into PylaDESS (Ondrus 2007). The experts can directly play on the computer and get real-time feedback after they finish their evaluations.

As discussed, there are two distinctive phases in the research which have two different operational modes. They are based on the same rigorous theoretical background. However, they mostly change in terms of how the data is collected. During the first phase, we visit all companies independently. We use PylaDESS during the interviews to collect the data, compute, and visualize the results. This data collection process is distributed and asynchronous. For the second round, we gather all the experts in one room, discuss about the first phase results, and then start the individual evaluation. The next step is to manually put the data into PylaDESS, compute and visualize the data in front of the audience.

4 Phase I: Assessment of the current situation

As discussed before, this phase is about assessing the current technology alternatives that are present on the Swiss market. We started this phase in November 2005 and finished it in May 2006. We visited each of the 20 companies once or twice; depending on how much time they could give us for collecting data.

The interviews were structured because of the precise data we need to build a MCDM model. Data collection last in average between half an hour and an hour, sometimes more. The duration of the interviews varied in time according to the number of experts participating. In general we had between one and three experts representing the companies. The profiles of the experts were heterogeneous ranging from strategy, IT, and marketing. It depended on who were the leaders of mobile payments projects in their respective companies.

We first looked at the recent developments in Switzerland and recognized that the market is still quite immature despite the growing interest in mobile payments. Many companies from different industries are working on mobile payment projects and trials. However, the deployment of mobile payment systems is still limited and touches only niche markets such as digital content, vending machines, and parking.

The structure of the Swiss market could be seen as an enabler or a disabler. An enabler because there are only few potential companies having interests in mobile payments. This situation could simplify the negotiation and discussions to synchronize efforts to bring a standard on the market. However, the clout of each stakeholder could be seen as a disabler. Swiss financial institutions have great influence due to their current active involvement in the payment sector and their well-known commercial ability to conduct profitable business cases. On the other side, mobile network operators have a privileged customer relationship with a large majority of the population. Swiss large retailers have a high volume of transaction and a great number of POS. In order to introduce a successful scheme on the market, there is a real need for collaboration between these economic giants. Logically, each of them has their own business priorities. Therefore, the coordination of these actors is not an easy task.

Due to the limited development of the Swiss market, we established a list of classic alternatives (Table 2) comprising: money (coins and bills), smartcards (chip), magnetic cards, contactless cards (RFID), mobile phone "proximity" (Bluetooth, Infrared), and mobile phone "remote (SMS, USSD, WAP, Java, …).

We also pre-established a list of criteria (Table 3) extracted from the literature, discussed in focus groups and later validated with several academic and industry experts. This was done to facilitate the work of the group of experts during the

Table 2 List of technology alternatives criteria used by the experts

Alternatives	Short description
Money	Regular cash (i.e. coins, bills)
Magnetic card	Plastic card with a magnetic stripe
Smartcard	Plastic card with a chip
Contactless card	Plastic card equipped with an RFID chip
Mobile phone "remote"	Mobile phone using a remote network (e.g. GSM, GPRS, UMTS). The payment transactions transit through a telco mobile network infrastructure. This could be done using SMS, Premium SMS, USSD, WAP
Mobile phone "proximity	Mobile phone using a proximity network (e.g. Bluetooth, Infrared). The payment transactions transit through a locally established wireless network

Table 3 List of criteria used by the experts

Criteria	Short description
Ease of use	This criterion refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis 1989)
Cost	It regroups direct costs (e.g. cost of the technology, cost of implementation) and indirect costs (e.g. infrastructure operation and maintenance)
Reliability	The purchase process should be flawless as it involves a financial transaction
User/market acceptance	This criterion represents the degree to which the user and the different stakeholders are already consenting to accept a technology for payment purposes
Security	Implicit security features (e.g. embedded encryption) and ease of securing the implementation of the technology
Flexibility	Degree to which the technology can be adapted in many different applications
Value proposition improvement	Improvement in value a technology could bring to the customer
Maturity	Development state of the technology
Speed	Implicit speed of the technology for payment processes
Scalability	Ability to grow. Usability in small and large environment

interviews. At this stage, each expert can still add or remove the criteria they considered relevant or irrelevant. After collecting data, we wrote a definition for each criterion based on the understanding of the experts. This ensures that we have a common language for the interviews. This list is naturally validated by the experts as they will select the criteria they perceive as relevant.

4.1 Results

Results of the first phase show that card technologies are preferred to phones for payment purposes (Ondrus and Pigneur 2007). In general, the smartcard and contactless cards had a high ranking as they performed better on most criteria. The position of the smartcard can be confirmed by the shift from magnetic cards to more secure cards. Concerning the contactless card situation, it is more surprising as there are not any national payment schemes proposing contactless cards. This might be a weak signal that the market will slowly move toward the contactless cards scheme, especially with the support of the technology providers and the public transportation companies. This could also open an opportunity for NFC. However, the current phone-based solutions remain in last positions of most industry rankings. This could be explained as mobile phone-based payment schemes are still in an early stage of development. There is still progress to be made in terms of ease of use, cost, reliability, and user/market acceptance. However, phone-based schemes already perform well in terms of flexibility and value proposition improvement. The three national mobile network operators consider value proposition improvement to be an important aspect, which explains why they believe that mobile phones have some future as a payment instrument.

5 Phase II: Assessment of NFC

For the NFC assessment, we changed our operational mode as explained in the methodology section. We adopted a real-time setting such as a roundtable. We organized this roundtable with all the companies that participated in our research. The biggest challenge was to gather all the experts in the same room. Luckily, we were able to gather 16 experts representing 14 different companies. The roundtable occurred in October 2006. The representation of the industry was optimal as we covered all relevant industry sectors (financial, telecommunication, retail, technology, and Public transportation). All of the companies who attended have participated in the previous campaign of interviews. Therefore, they were already quite familiar with our approach. Moreover, all the experts had knowledge about NFC, either because they are involved in national or international projects or they are closely monitoring the experiences made in the other countries.

During the first part of the roundtable, we made a presentation of the previous results obtained in Phase I. The objective was to refresh memories and open a discussion. We also wanted the experts to have a common understanding of the results before the evaluation of NFC.

During the second part, we distributed individual forms for each expert to evaluate NFC. These forms were customized with the criteria previously selected by the expert during the evaluation of Phase I. The experts had to evaluate NFC using the five value scale [i.e., weak (1), fair (2), average (3), good (4), excellent (5)] as done before. We allocated about 15 min for this process. Then, we collected the form and started to manually input their evaluations in PylaDESS. During that time, approximately 10 min, the experts were free to discuss with each other. After having inserted and computed the data, we immediately exposed the results to the experts.

In Fig. 2, the ranking shows the potential of NFC to be a successful technology choice for payment services. In comparison with the other mobile phone-based technologies (2.7/5), NFC performs much better as it has a higher score (3.6/5). In this ranking we observe that NFC is ranked as high as the contactless card. This evaluation is encouraging for NFC as its performance is close to card-based technologies, which are in use today.

In terms of outranking relations (Fig. 3), we can confirm the significant dominance of NFC over the Phone-Remote (64% of the experts had an outranking relation) and Phone-Proximity (71%). Even the smartcard does not outrank the Phone-based alternatives as much (50%).

In Fig. 4, the evaluations done by the experts show that NFC is performing quite well. In fact, most of the graphics are in the "green" zone (good or excellent). A black dot represents an expert and its height (y-axis) depicts the importance given to the criterion. As can been seen and could be anticipated, the two rather negative evaluations are on the criteria "Acceptance" and "Maturity". These issues will be naturally solved with time. This is the main reason why smartcards are performing better. Therefore, besides the infancy of NFC, the experts are quite confident. An important evaluation is the "value proposition improvement". The experts believe that NFC is excellent to create a better value to the consumers. This is critical for

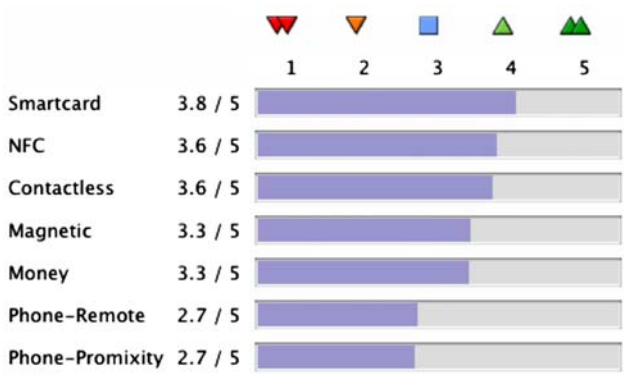

Fig. 2 Ranking of the technologies including NFC

	Money	Magnetic	Smartcard	Contactless	Phone-Remote	Phone-Promixity	NFC
Money	-	21	7	7	0	0	0
Magnetic	36	-	14	7	36	21	7
Smartcard	36	79	-	21	43	50	21
Contactless	7	21	29	-	36	50	14
Phone-Remote	0	7	0	7	-	36	7
Phone-Promixity	0	7	0	14	14	-	0
NFC	14	14	14	14	64	71	-

Fig. 3 Outranking relations of the technologies including NFC

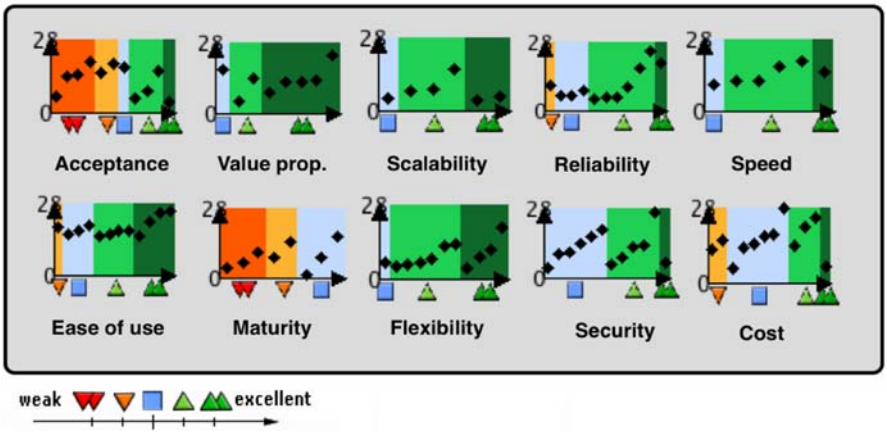

Fig. 4 Evaluation graphs of NFC

future business developments. In order for the consumers to switch from classic payments to mobile payments, they need to perceive some benefits in terms of value (e.g., convenience, flexibility, ease of use, secure).

Since NFC will be used on mobile phones, experts see the technology as scalable in terms of network and truly flexible in terms of applications. The good reliability and speed is assimilated with contactless cards, as the connectivity technology is quite similar. The experts are more prudent for the cost and security evaluation. The reason is the uncertainty concerning the implementation of NFC systems and their technical specifications. By looking at the criteria that makes NFC inferior to smartcard, we find that the disadvantages are mostly temporal. Therefore, with a constant improvement and stabilization of the technology, the evaluations already show that NFC might bring more value than the classic payment technologies.

This analysis of NFC helps us to obtain a new and better perception that can be used for diagnosis of the current situation. However, at this stage of the analysis, we cannot affirm that NFC will prevail. Our results indicate that NFC is a good candidate for mobile payments and should be taken into account in the development of the future payment market. Organizing this type of analysis with intervals of a few months would be useful to help follow the progress of NFC.

The experts welcomed positively the results obtained. They started a discussion about the future of NFC. The financial institutions and mobile network operators were quite enthusiastic based on these results. On the other hand, the technology providers were more reserved as the development and implementation of NFC could bring many interoperability and compatibility issues. Overall, the industry seems to appreciate NFC and would like to see it on the market.

6 Discussion

Even though the assessment of NFC shows encouraging results, there are still many technical and business issues that need to be solved. As we know, innovation is not only driven by the technology, but also depends on the business model implemented around it. Our evaluation mostly looks at the perceptions that experts have on NFC performance as a technology. Compared to other alternatives, NFC performs quite well in the eyes of the industry as it brings together the best features from the worlds of contactless smartcards and mobile phones. As can be seen in Fig. 4, the drawbacks of NFC (e.g., maturity, acceptance) are relatively dependent on the youth of the technology. These issues should be solved with time. The other criteria with better score (e.g., value proposition improvement, flexibility, ease of use) could lead to mass adoption. Furthermore, the good score of the criterion "scalability" could enhance the speed of deployment.

During an interview, one of the experts working for a technology provider stated that: "*there have been many trials and architectures developed for mobile payments. However, it seems that NFC is finally the technology that will make mobile payments better in every way*". Lessons have been learned from the past failures and have at last been used to create a suitable technology for payment services. This opinion of NFC seems to be shared among the group of experts, as our analysis shows.

As the experts who participated to the study are the architects for future payments systems in Switzerland, we can imagine that this more systematic analysis

consolidated their position on NFC. During previous interviews, experts were talking about how NFC will be successful. However, they had no formal comparison with other technology. Because of our study, they have some more precise explanations why NFC performs well in comparison with other technology alternatives. The results can give them a starting point for further analyses.

Besides the technology diffused on the consumer side (i.e., NFC mobile phones), the deployed infrastructure around NFC is a key factor of success. While some countries already rolled-out contactless schemes, some others still need to put in place the basic infrastructure requirements for contactless payments (e.g., closed-gate, contactless readers). In Switzerland, the current infrastructure of the merchants does not allow contactless payments. The cost of such migration can be consequent. Based on the experts' opinions, collaboration between stakeholders is needed in order to deploy a standardized architecture. The cost of implementation could be shared among different companies. This collaboration could help to reduce costs, increase number of POS and transactions. Industries such as public transportation and retail should be involved in the deployment of NFC mobile payments. Nevertheless, one of the recurrent factors hindering this collaboration is the organization of the value chain. It is not clear how the revenues should be split, who should own the customers and the transactions.

Even though there is an undeniable enthusiasm about mobile payment and NFC, some experts still doubt about the existence of a viable business case. The Swiss market (as other markets) is still small in terms of the customer base. For a mobile payment system to succeed there is a need for a high volume of transaction and a large customer base. If major industries do not sponsor mobile payments, there is almost no chance of success.

In line with our assessment, we have seen that NFC trials in several countries showed great results. The current focus of the mobile payment industry is to test and implement NFC trials. As an illustration, two industry consortiums in France are actively working and promoting their NFC trials, which involve financial institutions (Pegasus) and public transportation companies (Ulysse). Even credit card companies are actively launching different initiatives compatible with NFC phones (e.g., Visa Wave). In the UK, Barclays also launched a pilot with NFC phones that could be used for public transportation (Oyster card) as well as for credit card purchases (Barclaycard). These events are confirming the general enthusiasm about NFC, which we established and for which we gave some explanations several months ago with our roundtable.

7 Conclusions

In our research, we attempted to demystify the hype around NFC by collecting more precise data from experienced mobile payments experts from the Swiss industry. By achieving this study, we rationalized the preferences for payment technology and demonstrated that NFC performs much better than other existing mobile phone technologies. During the first phase of the research, we also evaluated the organizational aspects of mobile payments to make our research project scope

broader. As stated above, technology assessment is not enough to have a complete picture. The organizational aspects (e.g., organization of the value chain) also need to be analyzed. The results of this organizational analysis can be seen in a previous publication (Ondrus and Pigneur 2007). As an extension of the NFC assessment, it could be interesting to replicate this organizational analysis. This would show if the upcoming technology has also an impact on the organizational preferences of the experts.

For further research, a study of the NFC readiness of countries could be useful in order to understand the underlying dynamics of mobile payment markets. Parameters such as demography, regulation, market structure and general infrastructure need to be taken into account in order to fully evaluate the chance that NFC succeed.

Acknowledgments The work presented in this paper was partly supported by the National Competence Center in Research on Mobile Information and Communication Systems (NCCR MICS), a center supported by the Swiss National Science Foundation under grant number 5005-67322.

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