Acceptance of Mobile Payment Service Designs in Complex Ecosystems

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***Abstract*—This paper presents the results of an acceptance analysis of existing mobile payment services (MPS) and MPS concepts. The analysis was conducted by means of technical documentation on features and functionalities, usage tests and interviews with experts from the MPS ecosystem. The results indicate high acceptance of wallet MPS that support additional functionalities such as loyalty card inclusion. In addition, card-based MPS obtain high values for ease of use, and thus, might serve as transitional solution until technical standards are implemented in the ecosystem. Subsequent to a short introduction and presentation of the state of the art, the development of the evaluation framework of this study will be presented on which the analysis of the MPS at hand is based. The paper concludes with the design of a field study that will evaluate the acceptance of the suggested MPS in a real-world context.**

Keywords-mobile payment service; technology acceptance; external factors; complex ecosystem

I. INTRODUCTION

Recent market research indicates a growing importance of mobile payment. At the beginning of 2013, Gartner [1] predicted that the value of the mobile payment transactions will increase by 44 percent in 2013 compared to 2012, to an estimated $235.4 billion worldwide by the end of the year.

In some regions, such as Japan and the US, mobile payment is already part of people's everyday lives. The development on the European markets, on the other hand, is still behind prior expectations. There exists high insecurity among many potential stakeholders within the complex ecosystem of mobile payment. The insecurity refers to technology standards as well as service designs and business models.

What makes the ecosystem of different MPS "complex" is the fact that different pre-conditions and circumstances are relevant for each solution. Some examples include relevant partners in the value creation/delivery and supply chain process, a variety of contract forms, agreements, legal aspects, and responsibilities. For the user of a single MPS this complex ecosystem means that they might not be able to use the chosen MPS for the payment at a certain retailer, because the involved parties and companies are not in a contractual relationship that is necessary for a successful transaction at the point of sale.

Acceptance of mobile payment is an issue that has been addressed in various empirical studies. These resulted in interesting causal models of mobile payment acceptance with high explanatory power, e.g., [2], [3], and [4]. Acceptance by itself, defined as the decision to adopt or not adopt a MPS, is not sufficient to predict the market success of a particular payment service as their success is highly dependent on the ecosystem in which they operate and their actual design. Thus, there is a need to connect theoretical foundations from acceptance research to practical design issues of actual mobile payment services and to context factors that arise from the complex ecosystem in which mobile payment services operate.

The main objective of the present research project is therefore a systematic analysis of generic mobile payment services (MPS) within a novel acceptance evaluation framework that is derived from validated causal models of mobile payment acceptance. In a first step, it is necessary to develop the evaluation framework based on an extensive literature review. Mobile payment services are classified based on a market analysis and representative services are selected for each generic service. These are then analysed within the acceptance evaluation framework. Data for the analysis is obtained from service features and mobile payment service usage tests and expert interviews with service providers, banking and payment experts. The comparison of acceptance factors for each service results in a systematic assessment and enables conclusions regarding acceptance of the analysed mobile payment services. The paper concludes with an outlook on a subsequent field study. The research design of the field study is based on the major findings of the presented project and is necessary to evaluate the results of this research project in a real world context.

The paper is structured as follows: Section II presents the state of the art. In Section III, we describe how the evaluation framework was developed, which is the basis for the analysis of different payment services (Section IV). The paper concludes in Section V, with an outlook to our future work and study design.

II. STATE OF THE ART

Analysis of the state of the art will start with Section A, in which the technological implementations of mobile payment services will be presented, followed by Section B,

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which will provide an introduction to the acceptance factors of mobile payment services.

A. Technological implementations of mobile payment services

Mobile payment services can be classified according to technological designs and features that influence the payment process. The following classification is based on [5] and [6]:

- carrier medium,
- payment method,
- technology,
- type of payment system,
- payment process, and
- storage of sensitive customer data.

Mobile payment services are differentiated according to the carrier medium that is used. In this study, smart phones and Near Field Communication (NFC)-cards are considered as media types. The second criterion is payment method. Possible types are debit as well as credit cards, pre-paid mechanisms and direct debit processes. Debit card payment either initiates account debiting immediately after the transaction at the point of sale or a couple of days later. Credit card payment does not initiate immediate debiting of the account, but enables a loan without interest for the rest of the month. The amounts of several transactions are accumulated and account debiting takes place at the end of each month. Pre-paid payment requires money to be deposited on a card or smart phone in advance. The payment method is accepted at the point of sale as long as the account balance is positive.

An important issue is the technology that is used to communicate with the payment terminal at the point of sale. Common technologies are NFC, 2D-codes and bar codes. Payment systems operate either in form of so called open-loop systems or closed-loop systems. Closed-loop systems involve one single bank that processes the transactions whereas open-loop systems involve several banks in the transaction process. Payment processes are either offline or online. Online payment processes require input of a PIN by the user at the terminal. This is necessary for identification of the card holder. The card is checked online and the transaction will be completed only after successful verification. Offline payment, on the other hand, does not include verification of the available payment limit at the bank in charge of the account. There is no identification and card verification at the point of sale and communication takes place only between smart phone or card and the terminal. There exist four main types of sensitive customer data storage. The construction-wise inclusion of the secure element embedded in the smart phone is one technical option. A major disadvantage of this type is the connection of the secure element and its data to a particular phone that cannot be transferred to another device. Another option is usage of micro-SD cards that are equipped with a secure element. These can be put in the micro-SD slot of the smart phone and transferred in case of device changes. The secure element can also be stored on the SIM card. As these are bound to a certain mobile network operator this might hamper changes of the mobile network operator. The fourth option is storage of sensitive customer data on a card that is equipped with an NFC chip.

B. Acceptance factors of mobile payment services

Many acceptance research studies of mobile payment acceptance are based on technology acceptance model (TAM) [7], and thus, incorporate perceived usefulness (PU) and perceived ease of use (PEOU) as main factors influencing behavioral intention (BI) to use, e.g., [8], [9], [10], etc. A comparative study in different cultural settings [8] included technology readiness as a personality trait in the original TAM. Results of this study indicate a significant positive effect of technology readiness on PEOU and PU as well as BI in most cultural settings. Individual mobility as a personal requirement regarding technology characteristics and perceived security resulted in positive effects on BI or attitude towards mobile payment in [4]. Personal innovativeness is another personality factor that has been tested with significant positive effects within the TAM framework [10]. This study also included technology characteristics such as convenience and reachability that showed positive effects on either PEOU or PU.

Security is one of the most often tested technology characteristics. In most cases, it is operationalized as a perception of security [4]. It has also been empirically tested in the particular setting of mobile payment acceptance in tourism [11]. In some studies, security issues are regarded as aspects of perceived risk and operationalized within this construct [9] and [12].

Trust is a construct that obtained particular interest within mobile payment acceptance research. Trust has been tested as an antecedent of PEOU and PU [3] and it has been found that it is affected by characteristics of the mobile technology itself and characteristics of the service provider, such as reputation. An examination of trust within the valence framework indicated highly dynamic effects of trust in internet payment and initial trust in mobile payment on negative valences (perceived cost and risk) and positive valence (relative advantage) that is affecting BI [2].

Other studies are based on unified theory of acceptance and use of technology (UTAUT) [13] and include social influence and other constructs in addition to PU and PEOU to explain BI. In [14], UTAUT was extended by the mobile payment specific factors trust and perceived security. Both factors resulted in significant effects on intention to use mobile wallets in the research model.

Contextual issues have been included in various studies in different forms. We apply the multidisciplinary context model from [15] in order to classify these constructs and variables in a systematic way.

- Social context refers to people around the subject, their relationships to the subject, and interactions with the subject. Social context includes, for example, subjective norm [4], reference group evaluation [12], friends' evaluation [12], etc.

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- Task context considers the particular objective of the present usage situation. It is interpreted [16] as a breadth of mobile payment use situations [12] or circumstances in use situations.
- Physical context includes all objects that are surrounding the subject and their current status and direction. Examples for the inclusion are the construct individual mobility [4] and compatibility [17], [2].
- Temporal context is what gives the current usage situation a meaning like, e.g., past mobile payment use [12].

Value is a neglected factor in empirical research on mobile payment acceptance but is included in a theoretical model of mobile wallet adoption that has been applied in a case study [18]. N. Guhr et al. [8] define perceived value as "a trade-off between what customers receive, such as quality, benefits, and utilities, and what they sacrifice, such as price, opportunity cost, transaction cost, time and efforts" [18]. Finance-related risks, such as perceived costs, did not show significant effects on BI in an empirical study on acceptance of a card-based payment service [9]. A study on consumers' willingness to pay for mobile payment services indicated that consumers are either not willing to pay any fee for using mobile payment or the fee varies between different purchased goods [16]. Value is not only important in the context of user acceptance but also in the bigger context of the eco-system. Cost for the bank server and security as technology quality were included in an analytic hierarchy process and turned out to be important factors within the context of technological mobile payment decisions [19].

III. DEVELOPMENT OF EVALUATION FRAMEWORK

In this chapter, the evaluation framework will be described. First, an overview to the Evaluation Process (Section A) will be provided, followed by the selection of acceptance factors in Section B. These factors will be operationalized in Section C.

A. Evaluation Process

The evaluation is illustrated in Figure 1 (Sequence Diagram Evaluation Process). It shows that the process was based on the identification of relevant acceptance factors through literature review. These factors were operationalized and applied to all selected MPS by the means of usage tests and expert interviews. MPS were selected based on a thorough desk research, in which all information and data available were collected. Further and deeper information was gathered through usage tests and expert interviews. As a result, for each MPS and each of the relevant acceptance factors, a classification was suggested, whether the potential of acceptance of the MPS at hand is to be considered high, medium, or low. The evaluation process was carried out from February to August 2013.

This classification was based on a discussion process within the project team and double-checked by external MPS experts. Usability tests were not part of the analysis, as it can be assumed that this aspect will be covered in time before market launch of the MPS.

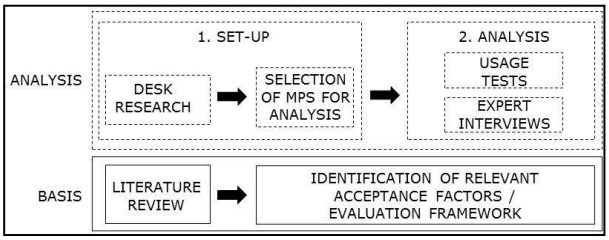

Figure 1. Sequence Diagram Evaluation Process

B. Selecting acceptance factors

Acceptance factors for the evaluation framework are derived from the literature review. PEOU and PU are the most widely used constructs to explain acceptance of mobile payment. Their concepts are provided in Table 1.

TABLE I. PERCEIVED EASE OF USE / PERCEIVED USEFULNESS

Acceptance Factor	*Construct*	*Definition*
Perceived Ease of Use	PEOU [9], [11], [10], [8], [14]	The original definition from [7] "the extent to which using a new system is expected to be free of efforts"
	PEOU [4]	"Important aspects related to mobile payment services ease of use include, for example, clear symbols and function keys, few and simple payment process steps, graphic display, and help functions […]"
Perceived Usefulnes	PU [9], [11], [10], [8], [14]	The original definition from [7] "the degree to which a prospective adopter believes that by using a particular system would improve his or her job performance"
	Attitude [12]	"This construct can be taken to reflect an individual's attitude towards a MPS, ranging from a very positive to a very negative assessment of the system's utility."
	PU [4]	"[…] users are only willing to accept innovations if those innovations provide a unique advantage compared to existing solutions […]"
	Convenience [10]	"Convenience is nothing but a combination of time and place utilities, which are clearly principal characteristics of m-payment."

Trust, perceived risks and (perceived) security were also included in many studies. Table 2 lists the various tested concepts.

TABLE II. SECURITY-RELATED FACTORS

Construct	*Definition*
Perceived risk [2]	"[…] extent to which prospective users expect mobile payment services to be uncertain or risky."
Initial mobile payment trust [2]	"Trust is a subjective belief that a party will fulfill his or her obligations according to the expectations of the trusting party."
Perceived risk [9]	"[…] the expectation of losses related to purchase […]"
Perceived security [11]	"[…] a threat which creates circumstance, condition or event with the potential to cause economic hardship […]"
MPS risk [12]	"The MPS risk construct refers to the possible harmful consequences an individual expects from MPS use […]"
Consumer trust [3]	"[…] in the context of m-payments, the two dimensions of consumer trust are trust in mobile service provider and trust in technology facilitated by mobile service provider characteristics and mobile technology characteristics respectively."
Perceived environmental risk [3]	"[…] is the risk associated with the underlying technological infrastructure […]"
Perceived structural assurance [3]	"[…] the consumer's perception about the institutional environment […]
Perceived security [4]	"In the context of electronic services, security risk, conceptualized as the likelihood of privacy invasion, has been found to be a particularly critical concern […]"
Perceived security [14]	"[…] the degree to which a customer believes that using a particular mobile payment procedure will be secure."
Trust [14]	"[…] the belief that vendors will perform some activity in accordance with customers' expectations."

External factors, such as necessary hardware or software adaptations, are included in the analysis due to their influence on provider decisions whereas other factors, such as availability and provider characteristics, are excluded from this analysis as these are highly influenced by time and location of assessment, e.g., Google wallet is currently not available in Austria but might be in future. Personal character traits and social influence are also excluded for this analysis as they are strictly individual but will be included in a future field study. The same is true for the different concepts of value which will be in the focus of the field study.

C. Operationalization of acceptance factors

In a next step, the four major constructs were operationalized in order to obtain measures for mobile payment service usage tests and issues for the expert interviews. These methods were necessary, as detailed desk research on the technical features and functionalities was only partly able to cover the complexity of the topic at hand and usage tests were only possible for existing MPS. Details and functionalities regarding conceptualized MPS were obtained from interviews.

The process of operationalization focused on mobile payment procedures and features of different services.

Ease of use is analyzed considering the steps a user needs to take before using the mobile payment service and the process of each transaction. Moreover, some additional processes are considered such as PIN changes and payment history or analysis features.

Usefulness is analyzed with regard to transaction speed, i.e., average time that is required per transaction, considering quicker transactions as more useful. Also, additional functionalities are examined, such as integration of loyalty cards or shop finder.

Security is analyzed considering storage of sensitive customer data and risks that occur in operation.

External factors that affect the ecosystem are considered in terms of required adaptations at the bank and point of sale in order to enable the MPS to operate.

IV. ANALYSIS OF MOBILE PAYMENT SYSTEMS

Ten different existing mobile payment services and feasible mobile payment concepts were included in the analysis. They cover different combinations of technical implementations and designs. As a limitation, it has to be stated that the selection of MPS is based on desk research and the project team's understanding of the most possible combinations of technology and designs, no study or literature exists in this regard to suggest a different mode of selection:

1. NFC debit card in an open-loop system enabling online and offline payments (e.g. PSA Payment Services Austria GmbH with all Austrian banks)
2. NFC pre-paid card in a closed-loop system enabling offline payments (e.g. Quick by PayLife)
3. NFC credit card in an open-loop system enabling online and offline payments (e.g. Mastercard PayPass and Visa PayWave)
4. Debit/credit application for smart phones with additional NFC hardware in an open-loop system enabling online and offline payments (e.g. CardMobile)
5. Barcode debit application for smart phones in an open-loop system enabling online payments (e.g. Secure Payment Technologies GmbH - pilot test)
6. Account-based 2D-code application for smart phone in an open-loop system enabling online and offline payments (e.g. CellumPay)
7. NFC debit/credit wallet application for smart phone in an open-loop system enabling online payments (e.g. Google Wallet)
8. NFC credit wallet application for smart phone in an open-loop system enabling online payments (e.g. myWallet by German Telekom)
9. 2D-code debit/credit application for smart phone in a closed-loop system enabling online payments (e.g. Starbucks and Square)
10. NFC debit application for smart phone in an open-loop system enabling online and offline payments (concept only)

Table 3 provides an overview on relevant factors for assessing ease of use, taking into account aspects before usage, the process of transaction and additional aspects.

With regard to the required effort of users before usage and during each transaction, card-based MPS are most easy to use. Wallet applications are also easy to use and in most cases offer additional functionalities like in-application PIN changes that increase ease of use. Barcode-based MPS are least easy to use as they require additional activities in the course of each transaction process.

TABLE III. ANALYSIS OF EASE OF USE

MPS	*before usage*	*transactions*	*other aspects*
1	Existing card is replaced by NFC enabled card; no registration required	Amount appears on terminal display; card is put close to display; visual or audio signal; NFC chip information is read by terminal; card is removed; successful transaction indicated by visual or audio signal; random PIN requests	PIN is changed at the bank; no history or analysis available
2	Existing card is replaced by NFC enabled card; no registration required; top up money	Amount appears on terminal display; card is put close to display; visual or audio signal; NFC chip information is read by terminal; card is removed; successful transaction indicated by visual or audio signal; amount is debited immediately from prepaid account	No PIN; application for smart phone that reads NFC chip and provides transaction history and account balance
3	Existing card is replaced by NFC enabled card; no registration required; one contact payment required	Amount appears on terminal display; card is put close to display; visual or audio signal; NFC chip information is read by terminal; card is removed; successful transaction indicated by visual or audio signal; random PIN requests	No history or analysis available
4	Download iOS 5.0 or higher and application; additional hardware for iPhone; registration of card; top up money	Application is launched; smart phone is put close to display; visual or audio signal; amount is displayed; amounts from 20 Euro require individual passcode; transaction is confirmed	PIN can be changed via application; transaction history for 30 days and account balance
5	Online banking activation; application download; application and account activation via transaction number and activation number;	Application is launched; PIN authorization; payment code is provided; barcode on smart phone display is scanned at the terminal; transaction is verified online	PIN can be changed anytime
6	Application download; registration of application via text message; creation of mobile PIN; registr. credit card; activation of credit card	Phone number and payment ID are provided to cashier; cashier selects payment method; customer receives confirmation request; card is selected; PIN is entered; confirmation is sent as push notification; cashier receives confirmation	PIN can be changed via application; transaction history available;
7	Application download; account registration; activation of credit card; test transaction	Application is launched; smart phone is put close to display; payment information is transferred automatically; transaction is confirmed by customer	PIN can be changed via application; transaction history and payment analysis via Google account
8	Application download; replace existing SIM card by myWallet NFC SIM card; registration	Application is launched; login information is entered; customer selects card; smart phone is put close to display; transaction is initiated; amounts from 25 Euro require PIN	PIN can be changed anytime; transaction history available
9	Application download; card registration	Pay by square: Application is launched; card is selected and QR code appears; cashier scans QR code; invoice is sent via email Pay by face: application is launched; name and photo are assigned using GPS information; cashier confirms matching face and photo	PIN can be changed via application; transaction history and analysis available
10	no details available	no details available	no details available

Usefulness (see Table 4) ought to be highest for wallet solutions as they include additional functionalities. The same is true for code-based MPS, but there is no information available regarding transaction speed of these services. Card-based MPS are considered to be very fast considering transaction speed, and thus, increase user perceptions of usefulness but do not enable any additional functionalities.

TABLE IV. ANALYSIS OF USEFULNESS

MPS	*transaction speed*	*additional functionalities*
1	offline payment (up to 25 Euros) approximately 350 milliseconds; online payment takes longer as it requires a PIN	none
2	200 – 300 milliseconds at POS terminal; 500 milliseconds at ATM	none
3	approximately 1 second without PIN;	none
4	online payment approximately 1 second; offline payment less than 1 second	none
5	no details available	none
6	online approximately 4 to 7 seconds	loyalty card inclusion; sweepstakes; prepaid card handling; mobile ticketing; mobile commerce inclusion
7	depends on payment situation	personalization features; Google offers inclusion
8	no details available	individual daily transaction limits; loyalty card inclusion
9	no details available	shop finder; invoice via email
10	no details available	no details available

Security issues, which are analyzed in Table 5, are rather balanced among MPS except for stored value technologies.

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These might cause actual loss of money for the customer. Storage of sensitive customer data can influence ease of use as mobile phone and mobile network operator respectively are not easy to change in case of embedded secure elements or SIM-based secure elements. Transaction limits increase security, but may also harm ease of use and, in some cases, even usefulness, e.g., when transactions are made impossible. A similar effect is caused by PIN requirements. They increase security of the MPS but decrease ease of use and transaction speed.

TABLE V. ANALYSIS OF SECURITY

MPS	*storage of sensitive data*	*countermeasures against risks in operation*
1	on NFC chip on the card	random PIN requests (after five transactions the latest) for low value transactions; PIN required for transactions from € 25s
2	on NFC chip on the card	stored value technology is a risk considering theft as money is stored on the card with no further authorization required
3	on NFC chip on the card	random PIN requests (after four transactions the latest) for low value transactions; PIN or signature required for transactions from 25 Euros
4	secure element on MicroSD	only service provider can access secure element; additional app login possible; stored value is limited to € 50
5	none	barcodes are valid only once and only for 4 minutes; limit of 10 transactions per day; limit of € 100 per day; limit of 4 payments per hour
6	data is split between smart phone and remote server	mobile PIN for each transaction; remote deactivation of application available
7	embedded secure element and Google Cloud	remote deactivation available; transaction limit of $1.000 per day for one device and $10.000 for more than one device
8	SIM-based secure element	data encryption on NFC-SIM; card and smart phone can be locked; individual daily limits
9	not applicable	online deactivation of application available; pay by face: face authentication
10	SIM-based secure element	certificates to avoid fraud

Table 6 provides an overview of the relevant external factors for MPS analysis. Considering the point of sale, most MPS require adaptations with regard to terminals and software. Some are based on cash desk software adaptations as well. The most intrusive MPS design (number 6) even requires a connection between the point of sale and the remote server of the MPS provider. Effects on participating banks are minor to those on participating retailers. Those that require adaptations of the bank-wise core system are less likely to succeed unless initiated by the bank.

TABLE VI. ANALYSIS OF EXTERNAL FACTORS

MPS	*bank*	*point of sale*
1	adaptations in backend system required	NFC terminals and software required; no changes with regard to business processes and interchange fee model
2	none	NFC terminals and software required; no changes with regard to business processes and interchange fee model
3	none	NFC terminals required; no changes with regard to software, business processes and interchange fee model
4	none	NFC terminals required; particular module for low value transactions required; no changes with regard to business processes and interchange fee model;
5	adaptation of core system required	particular barcode scanner required (smart phone display scan enabled); cash desk software required; no interchange fee
6	none	connection of point of sale system to backend system and remote server; QR code printer or display required; no interchange fee
7	none	NFC terminals required
8	none	NFC terminals required; no changes with regard to business processes and interchange fee model;
9	none	QR code reader required; display required; adaptation of network, terminal and software infrastructure; acceleration of business processes (order, payment); no interchange fee
10	mobile issuing infrastructure including mobile network operators and banks required	NFC terminals required; no changes with regard to business processes and interchange fee model

V. CONCLUSION AND OUTLOOK ON FUTURE WORK (FIELD STUDY DESIGN)

Table 7 presents the results of the analysis, that indicate high potential of acceptance for NFC-based wallet MPS (number 7 and 8) and NFC card-based MPS (number 1, 2 and 10). Face verification did obtain optimistic results in the analysis, but requires very intrusive external adaptations, and, moreover, does not support open-loop payment systems. Whereas high ease of use and high usefulness are positive indicators of overall acceptance, the effects of security on ease of use and usefulness can be either positive or negative.

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TABLE VII. RESULTS ANALYSIS

MPS		*ease of use*	*usefulness*	*security*	*security → EOU*	*security → U*
1		high	medium	medium	negative	negative
2		high	medium	low	positive	positive
3		high	medium	medium	negative	negative
4		medium	medium	low	none	none
5		medium	?	medium	negative	negative
6		low	medium	high	negative	none
7		high	high	high	none	none
8		medium	high	medium	negative	none
9	Pay by face	high	high	high	positive	none
	Pay by square	medium	high	medium	none	none
10		?	?	medium	negative	none

In the field study design, card-based solutions will be tested against wallet MPS according to the obtained analysis results, taking the complex eco-system of mobile payment solutions into consideration. Therefore, a central aim of the field study will be the identification of those factors that add specific value to mobile payment and how these factors could be implemented successfully. "Success" will not only be measured by the extent of technology acceptance, but also by the extent to which the solutions are suitable for different personalities, use situations, social constellations etc., hence, taking a variety of context factors into account. The main research questions are:

- What kind of differences with regard to acceptance can be identified between card-based solutions and MPS?
- Are there acceptance differences between transaction types (debit vs. credit)?
- Differences could be stated regarding relative benefits, perception of value, perceived complexity, security, trustworthiness, and consequences of PIN requirements and the like.
- Which MPS is believed to be most successful (wisdom of crowds)?
- How is the concept of "wallet" perceived and rated and what are customers' associations and demands in this regard?
- Are there any influences/changes on daily routines expected? What kind of influences/changes are there? Are they the same for all MPS?

In order to tackle this huge variety of research questions and also taking the complex eco-system of MPS into account, the field study will consist of three parts, each applying different methods. In a field trial, 70 respondents will use two card-based solutions (debit, credit) and two mobile-phone-based MPS (debit, credit) over a period of two to three months complementing their common payment methods and provide feedback continually via standardized questionnaires, before, during and after the survey period. In addition in situ feedback will be provided via mobile questionnaire after each purchase. In total, each participant will be using MPS between eight and ten times at least, using each solution at least once.

After the trial, a small number of participants will be invited to take part in a co-creation session in order to further optimize the identified most promising MPS and also in order to explore possible consequences for their daily lives.

Besides the users' point-of-view, the experiences and perspectives of the major stakeholders in the MPS eco-system providing the test-setting (financial institute, acquirers, issuers, and retailers) will be thoroughly analysed by means of expert interviews.

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