Primary data collection

Approaches of service providers towards mobile payments

Author: Tatjana Apanasevic

Communication Systems Department
School of Electrical Engineering and Computer Science
KTH Royal Institute of Technology

Report from Communication Systems Department

TRITA-EECS-RP-2018:2
ISBN: 978-91-7729-749-9

SUMMARY

Mobile payments are new services enabled by evolution of information and communication technologies. These services can be provided by different types of actors both banks and non-banks. The understanding of capabilities and limitations of different service providers to act in local markets requires further understanding. Implemented research seeks to extend knowledge in this area. I have implemented research focused on approaches used by different types of service providers including banks, independent providers, operator billing providers, retailers, and public transport companies in six Northern European countries.

Exploratory part of the research aims to address the following research question: *What factors stimulate and hinder the introduction of mobile payments?* The main objective of this report is to present primary data collected during the research through interviews with contacted companies.

The collected primary data is classified and organised using the STOF (Service, Technology, Organisation, and Finance) model. Evidence is presented in tables. This primary data is further used for explanatory study. At the same time, this data can be used by other researchers studying the same area. The collected data is reach in facts and presents the overview of different strategies.

Keywords: Mobile payments, Contactless payments, NFC payments, Mobile ticketing

TABLE OF CONTENTS

1 BACKGROUND

Technological evolution in mobile communications results allows new mobile services. One example of such services is mobile payments. Mobile payments can be defined as 'payments for goods, services, and bills with a mobile device (such as a mobile phone, smart-phone, or personal digital assistant (PDA)) by taking advantage of wireless and other communication technologies' (Dahlberg et al., 2008b:165). Mobile payments can replace bank cards and cash and make payment safer and faster at a smaller cost. A noticeable growth in the mobile payment sector attracts actors from non-banking sectors worldwide. Some examples are: (i) mobile operators, for example, Vodafon that launched M-Pesa for Safaricom and Vodacom in Kenya; (ii) retailers, for example, Starbucks with the Starbucks App; Alibaba Group with Alipay; (iii) mobile phone manufacturers, for example Google, Apple, and Samsung; (iv) FinTech companies, for example, Square, iZettle.

The most successful examples of mobile payment services come from the emerging economies (McKinsey, 2016). Sub-Saharan Africa, the Southeastern Asia, and Latin America are leading in the terms of use of these services (GSMA, 2014; GSMA, 2016; Smart, n.a.; McCarty and Bjaerum, 2013). These economies are characterised by a lack of developed bank infrastructure, but the level of mobile phone penetration is rather high (McKinsey, 2016). Thus, mobile operators offer money transfer and financial services and serve the unbanked population.

Developed countries have a completely different situation. The rates of mobile payment adoption have been rather slow (Mallat, 2007; Dahlberg et al., 2008a; Ondrus et al., 2009; Ozcan and Santos, 2015). There are some successful stories of mobile payments, for example Osaifu-Keitai, a mobile wallet in Japan. But in majority of developed economies a big number of services fail. Some recent examples are 'Bart in Sweden (SvD, 2014), O2 Wallet in the UK (Clark, 2014), Valyou (Boden, 2015) and mCASH (SpareBank 1, 2017) in Norway, Swipp in Denmark (swipp, 2017)' (Apanasevic, 2018), and Isis (later Softcard) in the USA (Welch, 2015).

Researchers (Au and Kauffman, 2008; Dahlberg et al., 2015a, 2015b; de Reuver et al., 2015; Ghezzi et al., 2010; Staykova and Damsgaard, 2015) mention a number of obstacles for mobile payment penetration in developed countries. These are a well-developed bank infrastructure, an easy access to banking services, a high penetration of bank cards, behavior of customers and merchants, a complex ecosystem needed to offer mobile payments, and a lack of regulation. Ability of different service providers to act locally or globally and a better understanding of their capabilities and limitations require additional research (Dahlberg et al., 2015b). This research aims at contributing to this problem by focusing *on capabilities and limitations of different service providers to act in their local markets*. The aim of this report is to explore these capabilities and limitations. The exploratory part of research aims to address the following research question: *What factors stimulate and hinder the introduction of mobile payments?*

1.1 Aims and scope of research and this report

The main objective of this exploratory research is to identify what approaches use different mobile payment providers in order to deal with challenges and driving forces associated with mobile payment services. The main research question to answer is: *What factors stimulate and hinder the introduction of mobile payments?* The main objective of this report is to present primary data collected during the research through interviews with contacted companies.

Mobile payment services can be provided by different types of actors. I have carried out a research and analysed approaches of five types of providers used to address different challenges of mobile payments. The following types of service providers were considered: banks, independent providers, operator billing providers, retailers, and public transport companies. I considered the following services: mobile payments, mobile public transport ticketing, and contactless cards.

Geographically, the research covered services offered in six countries of the Northern Europe (i.e. Estonia, Denmark, Lithuania, Norway, Sweden, and the UK). These countries have a high level of smartphone penetration, access to fast mobile internet, population has similar level of access to

banking services, finally, a range of mobile payment and ticketing initiatives is launched in these markets. These were the major reasons behind selection of these countries. The interviews with company representatives were carried out during 2012–2017.

1.2 Academic research on mobile payments and mobile ticketing

1.2.1 Overview of related work on mobile payments

The history of academic research on mobile payments accounts for about two decade. Based on extensive literature reviews (Dahlberg et al., 2008b; Dahlberg et al., 2015b), during 1999–2014, the most popular directions of research have been customer adoption and technological aspects, analysis of business side has got relatively less attention.

Due to primary focus of research on service providers and their used approaches, this research is closely related to business side of mobile payments. Hence, it is important to understand what kind of research has been carried out in this area. Analysis of literature helps to identify three main research directions.

(i) A sub-set of publications is focused on analysis of ecosystems created for mobile payments. A few articles are focused on analysis of the payments market and its stakeholders and apply different economic theories (Au and Kauffman, 2008; Ozcan and Santos, 2014). Research focus of other articles (Hedman and Henningsson, 2015; Guo and Bouwman, 2016; Liu et al., 2015) is on analysis of ecosystems. The researchers use strategy theories and study the effect of cooperation and competition on business ecosystems developed for mobile payment services.

(ii) A number of researchers analyse business models for mobile payment services. The early studies (Pousttchi, 2008; Pousttchi et al., 2009) create the grounds for analysis of different mobile payments' use cases and propose a business model framework. Guo et al. (2013) use the STOF model (Service, Technology, Organisation, and Finance) and analyse the bank's perspective on business model development.

(iii) Mobile payments are example of multi-sided platforms and some researchers apply the theory of multi-sided platforms for research purposes (Kazan and Damsgaard, 2013; Ondrus et al., 2015; Staykova and Damsgaard, 2015; Zhong and Nieminen, 2015; de Reuver et al., 2015). Additionally, the researchers explore strategies of platform providers with the help of different strategy theories. A number of researchers propose and test research frameworks, for example, a framework to study strategies of platform providers (Kazan and Damsgaard, 2013), a framework to analyse market entry and expansion strategies (Staykova and Damsgaard, 2015); a framework for analysis of service innovation in co-opetitive environment (Zhong and Nieminen, 2015). Ondrus et al. (2015) examine platform openness strategies that can be applied at three levels (provider, technology, and user) and affect the market potential of the certain platform.

1.2.2 Overview of related work on mobile ticketing

Mobile ticketing represents one use case of mobile payments. Academic literature that is specifically addressing mobile ticketing represents a much smaller array of publications, however, it has a similar trend. This is, papers considering technical aspects of mobile payments represent the majority of publications. There are few publications (Brakewood et al., 2014; Cheng and Huang, 2013; Di Pietro et al., 2015; Mallat et al., 2009) exploring customer adoption of mobile ticketing. And just a few publications explore business side. Juntunen et al. (2012) explore business model of NFC (Near Field Communication) based mobile ticketing services. Markendahl (2013) analyses the ecosystem of SMS ticketing services in Sweden.

Summing out, this research aims at contributing to research on mobile payment and mobile ticketing services by exploring strategies and approached of service providers used in order to overcome challenges related to these services. Additionally, the research extends knowledge on business side of mobile ticketing services.

2 THEORETICAL RESEARCH FRAMEWORK

For research, I used the STOF model (Bouwman et al., 2008). This model represents a framework that helps to describe a business model. This approach was selected because STOF was designed for mobile services that are usually provided by a number of actors. Hence, the model offers opportunity to analyse value network and collaboration aspects needed to offer a service (Haaker et al., 2006). This model has been tested by researchers and applied to analyse business models of different mobile services: mobile ticketing services (Juntunen et al., 2012), mobile payments (Guo et al., 2013), and location based services (Ryschka et al., 2014).

The STOF model conceptualises business model and specifies four inter-related domains: service, technology, organisation, and finance (see Figure 1). The outcome of the designed business model should result in value offered to both: customers and service providers.

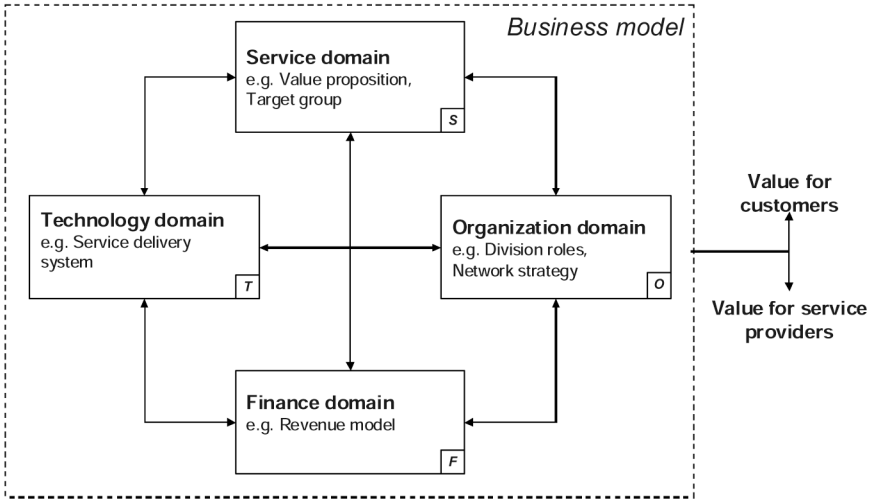

Figure 1. The STOF business model (Bouwman et al., 2008:36).

The service domain is related to such aspects as service offering, customer value proposition, and market segment to target (Haaker et al., 2006). It is important to understand what is value proposition of mobile services.

The key value proposition of mobile services is *mobility*. Researchers (Balasubramanian et al., 2002; Clarke, 2001; Heinonen and Pura, 2008; Kakihara and Sørensen, 2002; Pousttchi, 2008) specify *temporal mobility* that is related to time and may help to save time or to plan activities. *Contextual mobility* (Mallat et al., 2009; Kakihara and Sørensen, 2002; Pousttchi, 2008) is usually related to a certain situation. Mobile services additionally allow service *personalisation* and service adjustment based on individual needs (Balasubramanian et al., 2002; Chen and Nath, 2004; Clarke, 2001; Heinonen and Pura, 2008; Pousttchi, 2008). *Localisation* allows offering value using customer's geographic location (Balasubramanian et al., 2002; Chen and Nath, 2004; Clarke, 2001; Kakihara and Sørensen, 2002; Pousttchi, 2008). Additionally, mobile services increase convenience (Clarke, 2001; Vanhaverbeke and Cloodt, 2005) and help to enhance efficiency (Chen and Nath, 2004; Vanhaverbeke and Cloodt, 2005).

Mobile services may have a few types of customers: end users and business-to-business (B2B) customers. Value for B2B customers can be defined using term *value in use* (Lapierre, 1997). This term defines value gained by business customers after service delivery. Value in B2B context can be the following: (i) *economic or financial value* (Allee, 2000, 2008; Komulainen et al., 2007; Lapierre, 1997; Liu et al., 2005; Mallat and Tuunainen, 2008); (ii) *intangible value* in a form of knowledge, customer loyalty (Allee, 2000, 2008; Komulainen et al., 2007; Liu et al., 2005; Mallat and Tuunainen,

2008;); (iii) *enhanced service provision* (Chen and Nath, 2004; Mallat and Tuunainen, 2008; Vanhaverbeke and Cloodt, 2005).

The technology domain revolves around the technical functionality that is needed in order to offer a service (Haaker et al., 2006). Developed systems architecture, systems, applications, needed infrastructure, hardware are important points when considering functionality (Bouwman et al., 2008; Haaker et al., 2006).

The organisation domain is focused on resources and capabilities owned by a provider; value network that is created for the service; and resources and capabilities that are owned by actors in the network. The focus on value network is highlighted because in the case of mobile services one company has no own resources to offer the service and needs to collaborate with others (Bouwman et al., 2008; Haaker et al., 2006; Hedman and Kalling, 2003, Pateli and Giaglis, 2004).

Work in the value network requires setting a collaborative work framework. For the business model, the actors need to decide such questions as how to govern the value network and how to divide roles and responsibilities.

The financial domain represents an explanation how value network will get revenues from the service, what are the costs, and how network actors will share revenues, costs, and investments (Haaker et al., 2006). In the case of mobile payments, service providers need to set prices and for end users as well as for merchants (Eisenmann et al., 2006; Evans and Schmalensee, 2008).

3 METHODOLOGY

The study is based on interviews with different mobile payment service providers in order to understand how different types of service providers act in local markets and what factors stimulate and hinder introduction of mobile payments. The analysis is focused on different approaches used by service providers in order to address different aspects of business models developed for mobile payment services.

The researcher applied the qualitative multiple case study for this research. The approach was selected because analysis of multiple case studies enables a cross-case comparison and analysis, finding common patterns, and results in more precise research findings (Eisenhardt, 1989; Yin, 2009). The research started from in-depth literature study in order to gain a good understanding about main trends in research on mobile payments. This was followed by development of a case study protocol. This is a document that defines rules and procedures to follow in the multiple case study research (Yin, 2009). It is needed in order to be able to replicate procedure applied to one case study to another study.

In-depth semi-structured interviews were used as the main primary data collection method. The interviewing process consisted of interview protocol development, setting an interview, and transcription of recorded interviews. The interview protocol had the following structure: (i) presentation of the interviewee and the company, (ii) background information about the service (history, service description, service introduction in the market), (iii) partners taking part in the service offering (their roles, responsibilities, ways of cooperation), (iv) business customers (target segment, feedback), (v) end users (target segment, feedback), and (vi) noticed pros and cons of the service (Apanasevic, 2018). The sample interview protocol is provided in Appendix A. The interview duration was about one – two hours.

The aim of interviews was to collect perspectives of different mobile payment service providers showing how they address challenges of mobile payments. For this reason, different types of mobile payment service providers were contacted. These are banks, independent mobile payment service providers, direct operator billing providers, retailers, and public transport companies. Additional data was gained through interviews with stakeholders of mobile payments: central banks, mobile operators, payment processors, Trusted Service Manager, and industry consultants (see Appendix B). The researcher interviewed 42 industry representatives and implemented 43 interviews. One respondent provided a written response.

Majority of contacted respondents are top- and middle-level managers. They were involved and actively developed the corresponding mobile payment service. This qualified them as experts with needed knowledge. The researcher carried out interviews between April 2012 and January 2017.

Triangulation of different sources of data leads to a better construct validity (Yin, 2009). The researcher used secondary data in order to complement primary. The examples are corporate websites, press releases, market analysis reports, and online media articles.

3.1 Case study selection

Geographically, this research is focused on six Northern European countries: Estonia, Denmark, Lithuania, Norway, Sweden, and the UK. These countries were selected because a number of mobile ticketing and mobile payment initiatives have been launched and used there. At the same time, these countries have some similarities in terms of high penetration of smartphones, accessible fast mobile internet, similar level of access to banking services. There are also differences in regulation, level of competition, entry barriers (Apanasevic, 2018). Comparison of approaches used by service providers in different market settings may provide interesting research results. This research includes 13 mobile payments cases and 18 mobile ticketing cases (see Table 1 and Table 2).

Table 1. List of mobile payments case studies.

Country	Case study	Provider(-s)	Type of provider(-s)
Sweden	1. Bart 2. Swish, 3. WyWallet 4. SEQR 5. ICA card	Swedbank GetSwish AB WyWallet (owned by PayEx) Seamless ICA Banken	Bank Collaborating banks Operator billing provider Independent provider Retailer's bank
Norway	6. Vipps, 7. Valyou, 8. MeaWallet	DNB bank TSM Nordic MeaWallet (owned by Seamless)	Bank Mobile network operator and a bank Technology solution provider
Denmark	9. MobilePay	DanskeBank	Bank
Estonia	10. Fortumo	Fortumo	Operator billing provider
Lithuania	11. Mokipay 12. PaySera 13. WioPay	Mokipay Paysera WoraPay	Independent provider Independent provider Independent provider

Table 2. List of mobile ticketing case studies.

Country	Case study	Provider(-s)	Type of provider(-s)
Sweden	1. SMS ticketing 2. In-app ticketing 3. In-app ticketing 4. In-app ticketing 5. In-app ticketing 6. In-app ticketing 7. In-app ticketing	Swedish public transport companies Bleningetrafiken Länstrafiken Kronaberg Skånetrafiken Västtrafik Karlstadsbuss SL	All public transport companies Public transport company Public transport company Public transport company Public transport company Public transport company Public transport authority
Norway	8. #Ruter, In-app ticketing 9. BIBO* solution 10. In-app ticketing	Ruter Ruter Skyss	Public transport company Public transport company
Denmark	11. SMS ticketing 12. DOT, In-app ticketing	Copenhagen Metro and Movia Copenhagen Metro and Movia	Public transport companies
The UK	13. Contactless card	Transport for London	Public transport company
Estonia	14. T-piliet, In-app ticketing 15. T-Solutions, In-app ticketing 16. Jiffi, BIBO* solution 17. Ridango, In-app ticketing	T grupp T grupp Jiffi Ridango	Technology solution provider Technology solution provider Technology solution provider Technology solution provider
Lithuania	18. mTicket, In-app ticketing	Susisiekimo paslaugos	Public transport company

*BIBO – Be In Be Out

3.2 Analysis framework

In this research I apply the STOF model. The model considers four business domains. Researchers (Bouwman et al., 2008) specify a number of critical design issues within each domain. These variables describe important aspects of business model and are critical for its viability (Bouwman et al., 2008). The critical design issues found in each domain are the following (Bouwman et al., 2008):

- *Service domain*: targeting, creating value elements, branding, and customer retention.
- *Technology domain*: security, quality of service, system integration, accessibility for customers, and management of use profiles.
- *Organisation domain*: partner selection, network openness, network governance, and network complexity.
- *Finance domain*: pricing, division of investment and risks, valuation of contributions and benefits, division of costs and revenues.

The summary of descriptions of these critical design issues is in Table 3. Critical design issues help to design a viable business model aiming at creating value for customers and involved business actors.

Table 3. Critical design issues in the four business model domains
(source: Haaker et al., 2006:652, 654, 655, 657).

Critical design issues	Description	Balance of requirements
Service domain		
Targeting	How to define the target group?	Generic versus niche service B2C versus B2B service
Creating value elements	How to create value for the targeted service users?	Technological possibilities versus user needs and wishes
Branding	How to promote/brand the service?	Service brand promotion
Customer retention	How to stimulate recurrent usage of service?	Customer lock-in versus customer annoyance
Technology domain		
Security	How to arrange secure access and communications?	Ease of use or privacy versus abuse
Quality of service	How to provide for the desired level of quality?	Quality versus cost
System integration	How to integrate new services with existing systems?	Flexibility versus cost
Accessibility for customers	How to realise technical accessibility to the service for the target group?	Open versus closed system
Management of user profiles	How to manage and maintain user profiles?	User involvement versus automatic profile generation
Organisation domain		
Partner selection	How are partners selected?	Access to resources and capabilities of others
Network openness	Who is allowed to join the value network?	Desired exclusiveness, control, and customer reach of service
Network governance	How is the value network orchestrated? Who is the dominant actor?	Customer ownership and control over capabilities and resources
Network complexity	How to manage increasing number of relationships with actors in a value network?	Controllability of value network and access to resources and capabilities
Finance domain		
Pricing	How to price the service for end-users and customers?	Realise network profitability Realise market share
Division of investment	How to divide the investments among business partners?	Match individual partners' profitability and risk
Valuation of contributions and benefits	How to measure and quantify partners' contributions and (immaterial) benefits?	Fair division of costs and revenues
Division of costs and revenues	How to divide the costs and revenues among business partners?	Balance between individual partners' profitability with network profitability

3.3 Analysis process

The unit of analysis is a company. Analysis is focused on approached used by different actors towards development of business models for mobile payment services. For analysis purposes, the case studies were classified in five groups. The classifying criterion is the type of actor providing the service. Within this research, these are banks, independent providers, direct operator billing providers, retailers, and public transport companies.

Based on interview transcripts, I structured primary data for each case based on critical design issues (see Table 3). Classification was based on description of each critical design issue. For example, for *Targeting* (the service domain), I was checking which market was targeted by each service provider; was the focus on business-to-business customers or end users; and which customer market segment was in the focus. This way, I have analysed each critical design issue.

The primary data structured based on critical design issue is presented in the next sections. In tables, under each critical design issue I list approaches used by service providers in order to address a certain issue and mark a certain provider that used this approach. Hence, each dot in the tables on critical design issues represents an observation for each case study. I observe approach used by a certain actor, list it under corresponding critical design issue, and put a dot. If the observation exists – this is Yes, and if it does not exist – it is No (i.e. no dot).

4 MOBILE PAYMENT SERVICES PROVIDED BY BANKS

4.1 Brief summary of case studies

Case studies are discussed in more details in Apanasevic (2018). I provide only a brief case summary below.

4.1.1 Bart, Sweden

Bart was a bank account-based mobile payment solution. It was launched by Swedbank, in 2011. The solution targeted payments at Point of Sale (PoS). The main partner was Axfood, the third largest Swedish retailer. It launched this solution in 400 stores of Willy:s and Hemköp grocery chains by June 2013 (Swedbank, 2013). First, the service targeted only Swedbank's customers who were also customers of Axfood. Later customers of any banks could use the service. However, the service had a low number of customers and was closed down in February 2014. Summary of the Bart case is presented in Table 4.

Table 4. Summary of the Bart case.

Criteria	Description
Provider(-s)	Swedbank
Type of solution	Bank account-based PoS solution
Service/ Payment scenario	A bank card replacement for PoS payments
Infrastructure	Visa/MasterCard infrastructure A need for a separate payment terminal
Partner(-s)	Axfood, the third largest retailer
Merchant network	400 stores of Axfood's grocery chains (Willy:s and Hemköp)
Customers	First: Limited to Swedbank's customers who were Axfood customers Later opened for all customers

4.1.2 Swish, Sweden

Six major Swedish banks (SEB, Swedbank and Sparbankerna, Danske Bank, Handelsbanken, Länsförsäkringar, and Nordea) jointly developed Swish, a mobile payment solution. The service was launched in December 2012. In 2012, the banks founded GetSwish AB, which is responsible for management of the Swish intellectual property and brand. The service is build on top of the existing payment infrastructure. The service is connected to customers' bank accounts. In the beginning, the service allowed person-to-person (P2P) payments. Later, the service offered a payment solution for business customers (customer-to-business, C2B). Summary of the Swish case is presented in Table 5.

Table 5. Summary of the Swish case.

Criteria	Description
Provider(-s)	Swedish banks
Type of solution	Bank account-based P2P solution, later became C2B solution
Service/ Payment scenario	P2P, an easy cash replacement solution Other options: C2B, e-commerce, m-commerce
Infrastructure	Use of the existing Swedish payment infrastructure, real-time payment platform Bankgiro, MobileID No need for a separate payment terminal
Partner(-s)	Swedish banks, other payment market representatives
Merchant network	Small stores, payments in the apps, online
Customers	All customers of banks offering Swish (about 98% of population)

4.1.3 MobilePay, Denmark

Danske Bank launched MobilePay in May 2013. This is a bank independent service that is based on bank cards and is using the existing payment infrastructure. First, the service allowed P2P money transfers between end users. Gradually, the solution has got a number of functionalities: solution for

businesses (C2B), solution enabling payments in the mobile apps of merchants, and solution for e-commerce. Summary of the MobilePay case is presented in Table 6.

Table 6. Summary of the MobilePay case.

Criteria	Description
Provider(-s)	Danske Bank
Type of solution	Bank card-based P2P solution, later became C2B solution
Service/ Payment scenario	P2P, an easy cash replacement solution Other options: C2B, e-commerce, m-commerce, transport ticketing payments
Infrastructure	Use of the existing Danish payment infrastructure No need for a separate payment terminal
Partner(-s)	-
Merchant network	Small and big stores, payments in the apps, online
Customers	Bank-independent solution, targets all population

4.1.4 Valyou, Norway

Valyou was a NFC-based solution provided by TSM Nordic. This was a joint company created by Telenor, the largest Norwegian mobile network operator, and DNB Bank, the largest Norwegian bank, which were the main partners. The solution was launched in November 2014. It was a bank card-based service with the secure element placed in the SIM card. The solution only offered PoS payments. The customers wishing to use Valyou had to be customers of DNB Bank and Telenor, have Visa card and Android phones. Merchant network accepting the service represented about 2000 stores. However, the number of users was low and the service was terminated in November 2015. Summary of the Valyou case is in Table 7.

Table 7. Summary of the Valyou case.

Criteria	Description
Provider(-s)	TSM Nordic, DNB Bank and Telenor,
Type of solution	NFC solution, secure element in SIM card, bank-card based solution for PoS payments
Service/ Payment scenario	PoS payments Bank card replacement
Infrastructure	Use of the existing payment infrastructure A need for NFC-enabled payment terminals
Partner(-s)	DNB Bank and Telenor SpareBank1 and Scandia:banken joined the initiative later
Merchant network	Merchants with enabled NFC payment terminals (about 2000 stores in Norway)
Customers	Customers of DNB Bank and Telenor, having Visa card, and Android phone

4.1.5 Vipps, Norway

In May 2015, DNB Bank launched Vipps. This is a bank card-based solution using the existing payment infrastructure. This a bank independent service and initially it offered P2P money transfers. Later the bank offered C2B solution that enabled payments in the store, in the app, and online. Summary of the Vipps case is in Table 8.

Table 8. Summary of the Vipps case.

Criteria	Description
Provider(-s)	DNB Bank
Type of solution	Bank account-based P2P solution, later became C2B solution
Service/ Payment scenario	An easy cash replacement solution Other options: C2B, e-commerce, m-commerce, transport ticketing payments
Infrastructure	Use of the existing payment infrastructure No need for a separate terminal
Partner(-s)	Other banks joined the initiative
Merchant network	Small and big stores, payments in the apps, online
Customers	Bank-independent solution, targets all population

4.2 Critical design issues: Findings

4.2.1 Service domain

It is possible to identify two different patterns in the service domain (see Table 9):

Approach 1. Bart and Valyou services targeted general market and were focused on PoS payments in stores. Service providers aimed to simultaneously attract both merchants and customers. Both services did not provide clear value neither to end users nor to merchants. The services just replaced a bank card. Added value services were planned but not launched. The services had a high security level. In the Valyou case, the bank was responsible for service marketing but did not do that. Finally, these services did not offer new services of functionalities.

Table 9: Critical design issues in the service domain.

Description of factors	Bart	Valyou	Swish	MobilePay	Vipps
Targeting					
General market	•	•	•	•	•
Consumers and merchants	•	•			
Segment by segment (P2P, C2B)			•	•	•
Creating value elements					
No clear value for end users: just a card replacement at PoS	•	•			
Clear value for end users that do not carry cash			•	•	•
No clear value for merchants: no loyalty programmes	•	•			
Clear value for merchants: increased revenues, big customer base, integration with loyalty programmes, e- and m-commerce			•	•	•
Branding					
Secure service	•	•	•	•	•
No marketing		•			
Word-of-mouth			•	•	•
Customer retention					
No bundling, no new services	•	•			
Service bundling, new functionalities			•	•	•

Approach 2. Swish, MobilePay, and Vipps targeted general market. However, in these cases targeting approach reflected a growth strategy, where banks were targeting one market segment by another. First, the banks were focused on private customers and P2P service. When the customer base reached critical mass, banks entered another market segment – C2B service for small and medium businesses. Finally, they made it possible to integrate mobile payment solutions in the apps of others.

> '*The idea was to reach a critical volume in P2P based on customer base. Then it would be attractive for merchants to use payments in Swish, and then – e-commerce service*' (Swish).

These services offer a clear value proposition to customers that are used to pay with bank card and do not carry cash. Value for merchants is increased revenues, big customer base, integration with loyalty programmes, e- and m-commerce.

> '*Feedback from merchants: it [Swish] gives them more money because not all people have cash*' (Swish).

Swish, MobilePay, and Vipps are provided by banks and have a high security level. All these services gained popularity mainly due to positive word-of-mouth.

> '*Important factors [for spread of Swish] are: word-of-mouth and social media, and also good press*.' (Swish).

In order to keep customer loyal, these services offer new services for customers (e.g. Swish app offers QR-code reading, list of favorites, and history; MobilePay app has an opportunity to link the service to six payment cards, save digital receipts, loyalty programmes). In addition, these services are integrated

as payment instruments in app of merchants, mobile ticketing apps, and can be used to pay parking fees.

4.2.2 Technology domain

Approaches to critical design issues are summarised in Table 10. Majority of services are easy to use (e.g. '*[Swish] is an easy and fast access to your money*' (Swish)). The exception was Bart that was not easy to use for both cashiers accepting payment and end users. Payment services require full user identification. Mobile payments provided by banks are secure. Service access is secured by PIN codes and MobileID. Contactless payments with Valyou and MobilePay do not require PIN code for small amounts (below 200 NOK and 250 DKK retrospectively).

Table 10. Critical design issues in the technology domain.

Description of factors	Bart	Valyou	Swish	MobilePay	Vipps
Security					
Service not easy for end users and merchants to use	•				
Easy to use service		•	•	•	•
Full user identification	•	•	•	•	•
Service uses existing payment infrastructure	•	•	•	•	•
Use of PIN code	•	•	•	•	•
Contactless payment: no PIN code for small amounts		•		•	
Quality of service					
Use of immature technology resulted in technical customer enrolment issues		•			
High quality service	•		•	•	•
Management of user profiles					
Banks perform management of user bank accounts	•	•	•	•	•
Service integration					
Mobile payment service are interoperable, integrated, and compatible with the existing payment infrastructure	•	•	•	•	•
A need of separate payment terminals	•				
Development of unified service standard			•	•	•
Accessibility by customers					
Service is open to bank's own customers			•		
Only certain groups of customers can use the service	•	•			
Service open to all customers, independent on bank				•	•

Bart, Swish, MobilePay and Vipps ensure high service quality. This includes instant payments in real time, integration with retailers' loyalty programmes, service personalisation. In Valyou case, providers selected a new technology of secure element in a SIM card. However, this technology was immature at that time. This resulted in high rate of failure (about 30%) during user enrollment process. The service was functioning well if the user had managed to personalise the SIM card.

> '*[The Valyou solution] was based on Global Platform secure element technology in the SIM. As you are doing the personalisation of the card physically on the SIM, you are doing rather complex operations. … If you get problems during that process and it fails, … then you simply have to change the whole SIM card. I think it was something like 30% of those who tried to activate the service and failed due to execution errors on the SIM card. … That is not acceptable. … You need to get that failure rate below 2-5%. Otherwise it is considered unstable and broken*' (TSM Nordic).

> '*In my opinion, the checkout of [Valyou] payment experience below 200 NOK is one of the best. Even if you compare today's solutions like contactless*' (DNB Bank).

Banks perform user account management since mobile payment services are linked to bank accounts or cards.

In all cases, the solutions are interoperable, integrated, and compatible with existing payment and cashier infrastructures. Swish is an example of single service standard development. MobilePay and

Vipps became market standards in the markets by winning over competing solutions. One service (Bart) needed a separate infrastructure – specific payment terminals.

In the cases of MobilePay and Vipps, customers of other banks are able to use the service. In the cases of Bart and Valyou, customer groups that could use the service were limited. In the Swish case, the service is available to customers if their bank takes part in Swish. Hence, even though each bank offers the service to own customers, due to joint effort, banks jointly offer the service to about 98 per cent of the Swedish population.

4.2.3 Organisation domain

It is possible to track different approaches to partner selection and network openness (see Table 11). In Bart case, the bank collaborated with one retailer in order to access customers. And network was closed for other banks. Other retailers did not join.

In Valyou case, the bank collaborated with the mobile operator. The mobile operator provided technology and customer base. And the bank had needed resources and capabilities in the payments area. All other banks and operators were invited, but only a few banks joined the network. Merchants using NFC-enabled terminals accepted the service, but the biggest local retailers did not open up for the service.

In the Swish case, the banks cooperated for a single solution. This allowed reaching almost all population of Sweden. The network is open for other banks to join. Danske Bank developed the solution on its own and allows some banks to join as distribution partners. In Vipps case, more than 100 banks joined the network. The next plan of DNB Bank is establishing of a company that would manage the service. DNB Bank will leave 52 per cent of shares to itself and share remaining 48 per cent among other banks (Nysveen, 2017).

Table 11. Critical design issues in the organisation domain.

Description of factors	Bart	Valyou	Swish	MobilePay	Vipps
Partner selection and Network openness					
Partnership with a retailer in order to access its customers Network was closed for other banks	•				
Collaboration between a bank and a mobile operator Network was opened for other banks and mobile operators to join		•			
Collaboration between banks Other banks can join the network			•		
No partners for service development Other banks can join the network on certain conditions				•	•
Network governance					
The bank that owns the service is the key actor	•			•	•
Banks serve customers of other banks	•			•	•
The bank and the mobile operator are the key actors No deeper commitment to the service		•			
Banks-owners are the key actors Banks serve own customers Well-defined cooperation and competition aspects			•		
Network complexity					
Low level of network complexity	•			•	•
High level of network complexity		•	•		

There are different approaches to network governance. In three cases (Bart, MobilePay, and Vipps), the bank offering the service is the key actor, who serves customers of other banks. These central actors govern the service network.

In the Valyou case, TSM Nordic was the service provider, but the key actors were the bank and the mobile operator. In this case, the parties were not deeply committed to the service and did not perform responsibilities that were agreed. This way, Telenor was supposed to send NFC-enabled SIM card out

to customers in advance but was delaying to do so. At the same time, DNB Bank was supposed to market the service but was not doing that.

> '*We saw that banks, all the banks actually, were really reluctant to go in to this in the full forces because it never took up fast. And one of the reasons for that – it [Valyou] was not marketed [by banks]. … And you had the same on Telenor side. They did not want to send out the SIM cards before we had customers. But we will never get any customers if you do not send out SIM cards first, because the barriers to use the service are so high if you do not have a right SIM card before you start*' (TSM Nordic).

Swish case is different because the key actors are collaborating bank-owners. Additionally, there are banks-participants. Collaborating actors have a well-defined work framework and clearly set aspects of cooperation and competition.

> '*You need to work really hard with cooperation and to govern the process. Extra dimension about the collaboration is to set the frame. This is to define the rules and how to behave. … It is defined what things are ok to collaborate, and where you do not collaborate. It is stated in the rules. On other things banks compete with each other* ' (Swish).

In terms of network complexity, in the Bart, MobilePay, and Vipps cases, where one actor developed services, the network is relatively less complex. The Valyou case is an example of a complex ecosystem. It involves a few banks, a mobile operator, TSM, and Visa. Another example of complex network is Swish. A number of Swedish payment market actors take part in the service offering: major banks, the real time payment platform Bankgirot, and MobileID provider.

4.2.4 Financial domain

The common approach is to provide a service for free to end users, and to set a transaction cost for merchants (see Table 12). In the case of Valyou, Visa transaction cost was higher when compared to the cost of BankAxept, a domestic payment scheme used in Norway.

> *'Almost all or all merchants in Norway are using domestic card scheme and it is much cheaper than Visa and MasterCard*' (DNB Bank1)

> '*I think that the biggest barrier was the cost element. … Because the difference between the banks' set prices and the Visa and MasterCard scheme prices was so big, they [merchants] were not willing to turn on the [NFC] functionality [of payment terminals]*' (DNB Bank2)

Table 12. Critical design issues in the finance domain.

Description of factors	Bart	Valyou	Swish	MobilePay	Vipps
Pricing					
Mobile payment service is free for end users	•	•	•	•	•
Merchants pay transaction fee	•	•	•	•	•
Mobile payment has a higher cost than card payments		•			
Division of investments					
Investments shared with partners		•	•		
Valuing contributions and benefits					
Agreement based		•	•		
Division of costs and revenues					
Revenues come from increased volumes of digital transactions and transaction fees paid by merchants	•	•	•	•	•
Decreased cash handling cost	•	•	•	•	•
Fees paid to mobile operator for SIM card renting		•			
Other banks are distribution partners				•	

In two cases (Swish and Valyou), investment in service development was shared between collaborating actors.

Partners share their contributions and benefits based on agreement.

In all cases, the main sources of revenues are service fees and/or transaction fees paid by merchants. Banks also benefit from increased volumes of digital transactions. Reduced amount of cash leads to reduced cost of cash handling. In the Valyou case, the bank experienced additional costs related to

SIM card renting from the mobile operator. In MobilePay case, inviting other banks as service distribution partners can be a potential source of revenues for the service owner.

5 MOBILE PAYMENT SERVICES PROVIDED BY INDEPENDENT PROVIDERS

5.1 Brief summary of case studies

Case studies are discussed in more details in Apanasevic (2018). I provide only a brief case summary below.

5.1.1 SEQR, Sweden

SEQR is a mobile payment service developed by Seamless and launched in 2012. The service represents an alternative payment system with own service infrastructure and needs separate service accounts. The solution targets PoS payments and additionally offers a number of other options. Gothia and Collector, financial service and credit companies, take care of payment transfers and customer billing. Hence, the end users need a contract with either of the companies.

In the beginning (2013), the service provider was building a network of merchants. Free service roll out and service fee that is equal to a half of bank card fees is the offer for retailers. In 2014, Seamless started building customer base and offered a number of new options, such as a cashback payment and integrated loyalty programmes of some retailers. In July 2016, an introduction of host card emulation payment (HCE) allowed contactless payments for Android phone users. Summary of the SEQR case is in Table 13.

Table 13. Summary of the SEQR case.

Criteria	Description
Provider(-s)	Seamless
Type of solution	Separate service account based solution
Service/ Payment scenario	PoS payment solution Options: saved receipts, P2P transfers, p-commerce (payments in printed ads), e-commerce, and parking payments
Infrastructure	Alternative payment solution No need for a separate payment terminal because integrated with cashier system LS Retail
Partner(-s)	Financial service and credit companies Gothia and Collector
Merchant network	Small and big stores, payments in the apps, online McDonald's and Axfood the first retail chains
Customers	Targets all population

5.1.2 Mokipay, Lithuania

Mokipay is a NFC-based payment service for PoS payments. The service is based on separate pre-paid service account. Omnitel (now Telia), a mobile network operator, launched this service in August 2011. First, the service was available only for Omnitel customers, later – to customers of all mobile operators. Mokipay developed the service infrastructure. But due to a small number of customers and high service cost, the service failed in the general market. In the Table 14, this stage of the service history is labelled under mark '(i)'.

Starting from 2012, a local investment group invested in Mokipay and became the owner. One of business directions of this group is educational services. In the Table 14, this stage is labelled under mark '(ii)'. Since then, the service targeted schools. Integration of Mokipay with NFC-based schoolchildren's ID cards enabled contactless payments at school canteens. This allowed serving queues at canteens faster and reducing the amount of used cash. Other offered services include school attendance reports for parents, P2P transfers within the school, payments for printing and copying services, integration with electronic diary (www.tamo.lt) for schools. Summary of the Mokipay case is in Table 14.

Table 14. Summary of the Mokipay case.

Criteria	Description
Provider(-s)	Mokipay
Type of solution	Separate pre-paid service account based solution
Service/ Payment scenario	PoS payment solution, e-commerce, access service, P2P service
Infrastructure	Alternative service payment infrastructure NFC-enabled payment terminals
Partner(-s)	(i) Omnitel (ii) Education service
Merchant network	(i) Restaurants, pubs, sport arenas (ii) Schools
Customers	(i) Omnitel customers, then customers of all mobile operators (ii) Schoolchildren, parents, school canteens

5.1.3 Paysera, Lithuania

Paysera introduced its mobile wallet in 2013. This alternative payment service is based on a separate pre-paid account. The service targets PoS payments and additionally offers a number of other options. The service provider integrated the service with the most frequently used cashier systems.

The provider is focused on such payment scenarios where mobile payment would add value to customers. One scenario is related to lunch restaurants. The service offers opportunity to place the order and to pay with mobile phone at the restaurant. This considerably saves customer's time and restaurants have the opportunity to serve more customers. Payments with mobile wallet at petrol station is another scenario that also helps to save driver's time. There is a payment solution for small merchants. Service prices offered to restaurants and merchants are lower in comparison to prices of bank cards. Summary of the Paysera case is in Table 15.

Table 15. Summary of the Paysera case.

Criteria	Description
Provider(-s)	Paysera
Type of solution	Separate pre-paid service account based solution
Service/ Payment scenario	PoS payment solution Options: saved receipts, P2P service, access to restaurant menus, e-commerce, parking payments, Paysera card
Infrastructure	Alternative service payment infrastructure No need for separate payment terminals because the service is integrated with main cashier systems
Partner(-s)	–
Merchant network	Restaurants, petrol stations, small merchants
Customers	Focus on specific markets: lunch restaurants during busy lunch hours, payments at petrol station

5.1.4 WoraPay, Lithuania and the UK

WioPay is a mobile payment service launched by WoraPay, a Lithuanian start-up. In Lithuania, the service was introduced in 2013. The solution aims to provide a platform connecting different mobile wallets from one side and merchants from another side. Hence, the service targets B2B customers that are merchants and payment service providers. Increased sales, reduced amount of cash, faster service, and more efficient work of personnel are just some benefits for merchants.

In 2015, the company has got support from Lloyds Banking Group and introduced its service in Lloyds restaurants in London. The service launched there is offering a pre-ordering service. The end users can place the order of drinks at cafes while commuting, collect when the order is ready, and this way to save queuing time. Summary of the WoraPay case is in Table 16.

Table 16. Summary of the WoraPay case.

Criteria	Description
Provider(-s)	WoraPay
Type of solution	Link between mobile wallets and merchants in Lithuania Pre-ordering in London
Service/ Payment scenario	Mobile wallet integrator in Lithuania Pre-ordering in London
Infrastructure	Own service infrastructure
Partner(-s)	Lloyds Banking Group in London
Merchant network	(Mobile) payment service providers and merchants in Lithuania Restaurants, cafes, pubs in London
Customers	All population in Lithuania/London

5.2 Critical design issues: Findings

5.2.1 Service domain

Approaches to critical design issues are summarised in Table 17.

One independent providers targets general market (SEQR). Three other providers make their service available to the general market, but target certain niches: Mokipay offers services for schools; Paysera targets restaurants, petrol stations, and small merchants; WoraPay offers services for restaurants, cafes, and pubs. It is possible to observe different approaches used for customer targeting: (i) service providers target both customers and merchants (Mokipay, Paysera); (ii) targeting segment by segment (SEQR); or (iii) focus on business customers only (WoraPay).

In the analysed cases, there are three types of customers: end users, merchants, other payment providers. All analysed services provide clear value to these customers:

(i) *Clear value for end users in a specific context*. SEQR, Mokipay, and Paysera offer a digital wallet service with a range of additional services. These wallets can be used in different payment scenarios (PoS and P2P payments, parking fee payments). At the same time, all four services offer a clear value in a specific context: SEQR offers cashback payments and integrated loyalty programmes of Hemköp, Willys, and Appoteksgruppen; Mokipay offers payments and a number of related services in the school context; Paysera offers pre-ordering and self-checkout services in the context of busy lunch hours at restaurants and self-checkout services in the context of petrol stations; WoraPay offers pre-ordering and self-checkout services in the context of cafes, restaurants, and pubs. These services allow customers to by-pass queues and save time, and to speed up the payment process.

(ii) *Clear value for merchants*. In all cases, merchants benefit from decreased amount of cash and faster service of customers. Pre-ordering and self-checkout services result in more efficient work of personnel that can serve more customers (Paysera, WoraPay). SEQR and Paysera offer lower service fees compared to bank card fees, and Mokipay service is cheaper than cash handling cost. This means that these services help to lower costs experienced by merchants. SEQR, Paysera, and WoraPay help to serve more customers and this results in increased turnover and merchants' revenues. WoraPay offers integration of different mobile wallets, this allows merchants to serve customers using different mobile payment services and helps to increase sales. SEQR integration with loyalty programmes helps to increase sales.

(iii) *Clear value for other payment providers*. The integration platform offered by WoraPay offers an opportunity to other payment providers to reach more merchants (WoraPay).

All analysed mobile payment services are secure. All services had marketing campaigns before service launch in the market. For example, Mokipay was marketed as the official payment solution of European Man's Basketball Championship (EuroBasket 2011) competition that took part in Lithuania. This created a good awareness. Additionally, SEQR, Paysera, and WoraPay constantly organise promotion campaigns. Internet marketing and direct sales are the most efficient meant to find business custoemrs.

'*I would say that there are two ways how to attract business clients: internet marketing, Google advertisement using some certain keywords, and direct work with clients. But the most efficient is direct sales in order to attract business clients*' (Paysera).

In order to ensure customer retention, all analysed services offer service bundling. This usually includes PoS payments, P2P money transfers, and e-commerce (SEQR, Mokipay, Paysera); per-ordering and self-checkout (WoraPay). Service providers offer new functionalities and service updates: cashback function and integration with loyalty programmes of merchants (SEQR); restaurant menus (Paysera); a number of services for schools (Mokipay). All services allow personalisation.

Table 17. Critical design issues in the service domain.

Description of factors	SEQR	Mokipay	Paysera	WoraPay
Targeting				
General market	•	•	•	•
Niche market		•	•	•
Private and business customers (C2B)		•	•	
Segment by segment (P2P, C2B)	•			
Business customers (B2B)				•
Creating value elements				
(i) Clear value for end users in a specific context:				
- Digital wallet with additional services	•	•	•	
- Pre-ordering, self-checkout			•	•
- Reduced queues, time saving, faster payment	•	•	•	•
(ii) Clear value for merchants:				
- Decreased amount of cash	•	•	•	•
- Faster customer service	•	•	•	•
- Lower cost	•	•	•	
- Increased turnover and revenues	•		•	•
- Pre-ordering enables more efficient work of personnel			•	•
- Integration of mobile wallets				•
- Integration with loyalty programmes	•			
(iii) Clear value for payment providers:				
- Reaching more merchants	•	•	•	•
Branding				
Secure service	•	•	•	•
Service marketing campaigns	•	•	•	•
Internet marketing, direct sales	•	•	•	•
Customer retention				
Service bundling	•	•	•	•
New functionalities, app updates	•	•	•	
Personalisation	•	•	•	•

5.2.2 Technology domain

Approaches to critical design issues are summarised in Table 18.

All solutions are easy for customers to use. At the same time, different services allow different levels of user identification. In the case of Mokipay, users can be anonymous. A user provides a phone number, name, and surname but there is no proof of identity, for this reason Mokipay limits '*how much money a customer can have on his account, and how much turnover can be done during a year*' (Mokipay). Paysera offers different levels of user identification ranging from anonymous to full identification depending on account turnover. SEQR and WoraPay require full identification. All services require use of PIN codes for payments. In some cases, however, PIN code is not used for micro-payments (e.g. no PIN code for amounts below 15 Euros (Mokipay); in the case of WoraPay this depends on settings of mobile payment providers). Additionally, all providers have developed own mechanisms to ensure service security, e.g.:

'[Security] includes tracking of logins: from other IP, from other country. Sometimes we sent a message to check if this is the client who made the payment, if not then we stop the service' (Paysera).

All service providers seek to ensure a high service quality. The offered services offer a simple payment process, e.g. '*consumer scans the QR-code, starts packing products, then enters the PIN code, and can leave*' (SEQR, Seamless). High service quality of mobile payments can be defined by option of real time instant payment, which is offered by all analysed services (HCE solution of SEQR, Mokipay, Paysera, WoraPay).

In the case of mobile payments, account can be created by user (Mokipay, Paysera) or by credit company (SEQR). Consequently, the account is managed by the provider (Mokipay, Paysera), or credit company (SEQR). The account data can be used for evaluation of customer credibility (Mokipay).

Independent providers develop own service platform with alternative infrastructure (SEQR, Mokipay, Paysera, WoraPay). Services require a separate service account. In the cases of Mokipay and Paysera, these are pre-paid accounts, in the case of SEQR – post-paid (credit) accounts and users get monthly bills, in the case of WoraPay – depends on the selected payment provider. In order to make services interoperable, independent service providers integrate their services with cashier systems (Paysera, SEQR, WoraPay). Mokipay is a NFC-based service that is compatible with NFC-enabled payment terminals.

Any customers may use the services. There are no limitations.

Table 18. Critical design issues in the technology domain.

Description of factors	SEQR	Mokipay	Paysera	WoraPay
Security				
Easy to use service	•	•	•	•
Users can be anonymous		•	•	
Full user identification	•		•	•
Different levels of user identification			•	
Use of PIN code	•	•	•	•
No PIN code for small amounts		•		•
Quality of service				
Simple payment process	•	•	•	•
High quality service	•	•	•	•
Management of user profiles				
Service provider manages user profiles		•	•	
Credit company manages user profiles	•			
Evaluation of customer credibility		•		
Service integration				
Building own technological platform and infrastructure	•	•	•	•
Separate service account	•	•	•	
Mobile payment service are interoperable and compatible with the existing payment infrastructure	•	•	•	•
Integrated within cashier systems	•		•	•
Accessibility by customers				
Open service accessibility for all customers	•	•	•	•

5.2.3 Organisation domain

Independent providers in most cases have a developed technological payment solution, some have financial license and contacts with retailers. These providers may collaborate with financial credit companies that are responsible for customer billing (SEQR) (see Table 19). In order to build own customer base, independent providers seek to reach them through collaboration with other business actors (e.g. partners (Mokipay, WoraPay) of large retailers (SEQR, Mokipay, WoraPay)). In order to make a new payment service compatible with the existing payment system, independent providers need to integrate it with cashier IT systems. Hence, these actors need to collaborate with cashier system providers (SEQR, Paysera). Due to specifics of the payments market in Lithuania, independent providers have to deal with intense competition from banks' side. This is a reason for providers to collaborate on different aspects (Mokipay, Paysera, WoraPay).

'*After linking Mokipay and Paysera, there is no need to waste time to top-up a Mokipay account; it is enough to add a Paysera account in the Mokipay app and to transfer money directly from it*' (Noreika, 2014).

The service networks developed by independent providers are usually closed for other providers.

Independent providers are the key actor in the value network. These actors govern the network and serve customers.

There is a relatively low level of network complexity. The main types of actors involved are: a service provider, business customers/merchants, and a business partner.

Table 19. Critical design issues in the organisation domain.

Description of factors	SEQR	Mokipay	Paysera	WoraPay
Partner selection				
Collaboration with credit companies for customer billing	•			
Collaboration with retailers, business side customers	•	•		•
Collaboration with cashier system providers		•	•	
Collaboration between independent providers		•	•	•
Network openness				
Closed network	•	•	•	•
Network governance				
Independent provider is the key actor	•	•	•	•
Network complexity				
Low level of network complexity	•	•	•	•

5.2.4 Finance domain

All independent providers offer mobile payments free of charge for users (see Table 20). Merchants represent the party paying service transaction fees. Service providers (SEQR, Mokipay, Paysera, WoraPay) seek to offer a competitive price when compared with other payment alternatives.

'*We do not position ourselves that the clients have to pay for this innovative service more. It would be difficult to enter the market this way. We are innovative, fact, flexible, and cheaper*' (Paysera).

'*The company's suggested transaction fee is a half less than the one offered by credit card companies'* (SEQR, Seamless).

In the case of Mokipay, the NFC payment service has a higher cost and it was difficult to offer a competitive service fee for merchants. The service can only compete with cash handling cost.

'*The NFC service is like an additional layer of this bank infrastructure that has both fixed and variable costs in itself. This means that the transaction cost of the NFC service suggested to retailers cannot compete with other payment infrastructure. Maybe sometimes the NFC service can compete with cash [with cash handling cost] but the service cannot compete with bank card transaction cost'* (Mokipay).

WoraPay invites other payment providers to join its service platform. This means additional sources of revenues, commissions paid by other payment service providers.

There is collaboration with partners in two cases (Mokipay and WoraPay). In the Mokipay case, the service provider collaborates with the provider of educational service within the same investment group. Lloyds bank is an investment partner for WoraPay. Valuation of contributions and benefits should be agreement-based.

In all cases, the major sources of revenues are merchants' paid transaction fees and/or service fees. Additionally, the service providers benefit from increasing volumes of digital transactions. At the same time, costs are related to: (i) commissions paid to involved partners, e.g. credit and financial institutions in the SEQR cases, and (ii) cost of mobile payment service integration with cashier systems (Paysera).

'*Integration [with cashier system] had a high price for us. ... There is one more moment – these cash register program's providers additionally charge for each upgrade. The payment size depends on the*

number of PoS. For small chain the charge fee is smaller, for a big chain it is higher. This makes negotiations difficult, because who should cover this cost. Possible options either we or the merchant. The cash register program's providers will not do it on their account. This is quite a painful moment because additional installation cost appears' (Paysera).

In order to attract customers, Paysera compensates banks transaction cost to end users who transfer money to Paysera accounts (Paysera). This is additional cost.

'*Now, Paysera covers the bank transaction fees when transferring money from bank account to Paysera account. We want to attract more customers, hence, this is free for them*' (Paysera).

Table 20. Critical design issues in the finance domain.

Description of factors	SEQR	Mokipay	Paysera	WoraPay
Pricing				
Mobile payment service is free for end users	•	•	•	•
Merchants pay a transaction fee	•	•	•	•
The cost of mobile payment is higher than cost of bank card payment but lower than cash handling cost		•		
Commissions paid by other payment service providers				•
Division of investments				
Investment shared with partners		•		•
Valuing contributions and benefits				
Agreement based	•	•		•
Division of costs and revenues				
Revenues come from increased volumes of digital transactions and transaction fees paid by merchants	•	•	•	•
Commissions paid to financial institutions	•			
The cost of service integration with cashier systems			•	
Compensation of bank transaction cost to end users			•	

6 MOBILE PAYMENT SERVICES PROVIDED BY DIRECT OPERATOR BILLING PROVIDERS

6.1 Brief summary of case studies

Case studies are discussed in more details in Apanasevic (2018). I provide only a brief case summary below.

6.1.1 WyWallet, Sweden

WyWallet, a mobile wallet service, was launched by 4T Sverige, a joint venture founded by Swedish mobile network operators. The service was introduced in the market in June 2012. In the beginning, the service was processing SMS payments. A payment processor, PayEx, was handling payments. At the launch time, the service was targeting public transport passengers. However, mandatory customer registration was negatively received by customers. In 2015, WyWallet was acquired by PayEx. The service was redesigned, and service access was simplified. Summary of the WyWallet case is in Table 21.

Table 21. Summary of the WyWallet case.

Criteria	Description
Provider(-s)	First 4T Sweden; then WyWallet
Type of solution	Direct operator billing (including payment in mobile phone bills)
Service/ Payment scenario	SMS payments, in-app payment (m-commerce), e-commerce
Infrastructure	Connection to platforms of mobile network operators
Partner(-s)	Mobile network operators, PayEx (payment handling)
Merchant network	Digital content providers, Facebook, charities
Customers	Customers having mobile phone subscription

6.1.2 Fortumo, Estonia

Fortumo is a direct operator billing provider from Estonia. The main idea behind direct operator billing is including online payments in mobile phone subscriptions. Fortumo is a global player and operates in more than 100 countries (Fortumo, 2017). Direct operator billing is commonly used in the area of virtual and digital goods. The provider targets customers in B2B context. These are game developers, social networks, music and video streaming services. Summary of the Fortumo case is in Table 22.

Table 22. Summary of the Fortumo case.

Criteria	Description
Provider(-s)	Fortumo
Type of solution	Direct operator billing (including payment in mobile phone bills)
Service/ Payment scenario	In-app payment (m-commerce), e-commerce
Infrastructure	Connection to platforms of mobile network operators
Partner(-s)	Mobile network operators
Merchant network	Providers of digital content, virtual goods, app stores, social networks
Customers	Customers having mobile phone subscription or pre-paid account

6.2 Critical design issues: Findings

6.2.1 Service domain

Approaches to critical design issues are summarised in Table 23.

Table 23. Critical design issues in the service domain.

Description of factors	Fortumo	WyWallet
Targeting		
Niche market: market of digital and virtual goods	•	•
Niche market: self-checkout service		•
Business customers, e.g.: digital content providers, payment service providers	•	•
Creating value elements		
(i) Clear value for end users:		
- Alternative to card payment	•	•
- Payment included in mobile operator's billing	•	•
(ii) Clear value for merchants:		
- High rate of conversion	•	•
- Competitive price	•	•
- Operator billing with no need to integrate with each operator	•	•
- Payment alternative to payment cards, cash, invoice	•	•
- Real time instant transaction up to 700 SEK		•
- Taking risk in the situation of fraud		•
(iv) Clear value for payment service providers:		
- Operator billing integration has a higher value for merchants	•	•
Branding		
Secure service	•	•
Direct sales	•	•
Participation at conferences		•
Big global player		•
Customer retention		
Simplified service access, adding new merchants		•
Better payment flow for end users, better technical and commercial conditions for merchants	•	

Direct operator billing providers target certain niche markets: (i) digital content, virtual goods, and media streaming (Fortumo, WyWallet), and (ii) sectors where customer do not interact with merchants directly and can use self-checkout option (e.g. parking payments) (WyWallet). In both cases, service providers target business customers, such as digital content and media providers, game developers, social network providers, and payment service providers.

In the analysed cases, there are three types of customers: end users, merchants, other payment service providers. All analysed services create a clear value to these customers:

(i) *Clear value for end users*. In both cases, operator billing represents alternative to card payment in the situation when the user does not want to use a payment card. Another advantage is opportunity to include payment in mobile operator's bill.

(ii) *Clear value for merchants*. Major value for merchants is an alternative means of payment, a competitive price, high conversion[1], and no need to integrate with each mobile operator (Fortumo, WyWallet). A WyWallet's offer additionally includes unique possibility to transfer instantly up to 700 SEK and taking risks in the case of fraud.

> '*[Benefits for merchants are] price and conversion. … The third item is actually risk. With us the risk is lower for the merchant than with a traditional card payment. If there is a fraud situation, etc. – this is on our responsibility. The merchants will receive their payments. We take the fraud risk'* (WyWallet).

[1] 'The conversion rate is the percentage of users who take a desired action' (Nielsen, 2013). When applied to e-commerce, the conversion rate represents the percentage of site visitors who actually made a purchase (Nielsen, 2013).

'*A merchant that wants to launch in may be 5 or 10 countries would need to integrate with every carrier [i.e. mobile operator] in these countries by themselves and negotiate the terms with every carrier. And, now, they can do it in shorter time. We have a technical connection usually ready in these countries. And if sometimes a merchant has special commercial conditions, we negotiate them on behalf of this merchant. And this is our core competence and core business. We do it much faster and we safe a lot of time for merchants. The main advantage is that actually they only need to integrate with us*' (Fortumo).

(iii) *Clear value for other payment providers*. Integration of direct operator billing extends a range of available payment instruments of other payment service providers. This increases value of their payment services for merchants.

Operated billing is branded as a secure service. These providers target B2B customers. This implies direct sales to merchants. Fortumo is a global player that has trust. This player has attracted large (tire one) merchants.

'*We are meeting them [tier one merchants] in the US, and in Asia, and at different conferences. And then at some point they start to trust us. And usually this kind of sale takes about one year or more'* (Forumo).

In order to retain customers, PayEx seeks to make WyWallet better. Now the service is redesigned, much simpler, does not require mobile app. Additionally, new types of merchants appear, such as digital media content providers, e-commerce. Depending on country, Fortumo may offer a smoother payment process to service users and offers attractive technical and commercial settings to merchants.

6.2.2 Technology domain

Approaches to critical design issues are summarised in Table 24.

Table 24. Critical design issues in the technology domain.

Description of factors	Fortumo	WyWallet
Security		
Requirement for users to register made service complicated in the past		•
Easy to use service	•	•
Full user identification using phone number as identifier	•	•
Development of own technological platform and infrastructure	•	•
Data is encrypted, no sensitive data sent		•
Quality of service		
Simple payment process	•	•
Easy integration for merchants	•	•
Management of user profiles		
Direct carrier billing provider manages user profiles	•	•
Service integration		
Mobile payment service is integrated with mobile operators and merchants	•	•
Accessibility by customers		
Service accessible for customers with subscription or pre-paid accounts	•	•

In the very beginning, customers considered WyWallet being too complicated service because of user registration. Since then the service was re-designed and considerably simplified. Today's operator billing solutions (Fortumo, WyWallet) are easy to use. A mobile phone's number fully identifies the user and is used as a token for service access. All sent and received information is encrypted and coded.

'*We have all the security measures that can be expected on a real time payment service. All our API calls are encrypted in a special way. … And only payment calls that are encoded in accordance to their codes will be accepted by the system. And within the system we have the same strict coding relationship between the core system and the respective operator charging system'* (WyWallet).

Fortumo and WyWallet seek to offer a high quality service. Service providers offer a simple payment process for end users, and easy service integration for merchants.

In both cases, the service providers manage user accounts.

Fortumo and WyWallet developed own service technological platforms and service infrastructure. Operator billing solutions are integrated with API platforms of mobile operators and merchants.

> '*We do technical integration to their [mobile operators'] billing API (Application Programming Interface). Through this API we can put charges on users' phones. On the other side, we provide our payment SD-key or payment web product to different game developers, social networks, streaming music, and streaming video providers, antivirus applications, any type of apps or services that are selling something virtual*' (Fortumo).

The service is available for any customer with mobile phone subscription or pre-paid account.

6.2.3 Organisation domain

Approaches to critical design issues are summarised in Table 25.

In order to provide a service, direct operator billing providers collaborate with mobile network operators and get access to their technical platforms. There can be collaboration with a payment processor that is in charge of internal payment settlement (WyWallet).

Other payment providers can enter the service network as business customers. The network is open from this perspective.

The key actors governing the network are the service providers (Fortumo, WyWallet). These actors manage the network and serve customers. WyWallet was a joint company of four mobile network operators, that are direct competitors and this caused some certain issues for strategic company management.

> *'Ultimately, these four companies had different drivers for establishing WyWallet. And I think that throughout the period during which they were the owners of the company, they had four different strategic perspectives on the company. And ultimately, that prevented the success of the company during their ownership. There was no 100%-agreement on the strategy'* (WyWallet).

The service network includes operator billing providers, mobile network operators, may include payment processors, other payment service providers as business customers, merchants, and buyers. This way, the network has relatively high level of complexity.

Table 25. Critical design issues in the organisation domain.

Description of factors	Fortumo	WyWallet
Partner selection		
Collaboration with mobile network operators	•	•
Collaboration with payment processors		•
Network openness		
Network is open for other payment service providers as business customers	•	•
Network governance		
Operator billing provider is the key actor	•	•
Network complexity		
High level of network complexity	•	•

6.2.4 Finance domain

Approaches to critical design issues are summarised in Table 26.

A service provider offer service for end users free of charge (WyWallet). If users want to receive an invoice, there is a special fee (WyWallet). Operator billing providers seek to offer a competitive price to merchants.

In 2013, Intell Capital and Greycroft Partners invested in Fortumo. This investment was used for business development.

Evaluation of contribution and benefits of network actors is based on agreements.

Table 26. Critical design issues in the finance domain.

Description of factors	Fortumo	WyWallet
Pricing		
Operator billing service is free for end users		•
Invoice sending fee for end users		•
Competitive service fee for merchants	•	•
Division of investments		
Investment from Intel Capital and Greycroft Partners		•
Valuing contributions and benefits		
Based on agreement	•	•
Division of costs and revenues		
Revenues from service fees paid by merchants	•	•
Revenue received from payment service providers using operator billing	•	•
Commissions paid to mobile operators (cost) (i.e. increased revenues of mobile operators)	•	•

Service providers get revenues that represent service fees paid by merchants and other payment service providers. The major cost is associated with commissions that receive mobile operators.

> '*And another limitation is of course commissions. Three-four years ago, one of the operators said that they want to charge from 30% to 50% commissions. … But we talk about newer types of segments, like App Stores, streaming music and video. These providers would be looking for commissions in the range of 10%-15%-20% of revenue share, may be 25%. App developers are used to receive 70% from Google and Apple. And this is some kind of benchmark. … We would also be very happy to provide services to companies like Uber. But these companies can afford paying away may be up to 3-4%, no more, otherwise there is no business case. As of today, there are not that many operators who would be able to provide these conditions'* (Fortumo).

At the same time, these commissions paid to mobile network operators increase their revenues. In the recent years, mobile operators faced decline in SMS traffic and call volumes. This is partly due to Over The Top (OTT) providers that offer services on top of the telecom infrastructure, e.g. Skype, Viber, Spotify, and Netflix. Operator billing services help mobile operators to get revenues from OTT services.

> '*Telcos are looking for new revenue sources. They see that the call cost is going down and call revenues and SMS revenues are going down because of all OTT services and messaging programs. … We tell them 'We can bring you the revenues from the sales. Messaging companies are selling stickers, they are selling the call times, and if you provide us these types of conditions, then we can integrate and bring you the revenues from this. These are completely new revenues, which right now you are not receiving*' ' (Fortumo).

7 MOBILE PAYMENT SERVICES PROVIDED BY RETAILERS

The case study is discussed in more details in Apanasevic (2018). I provide only a brief case summary below.

7.1 ICA Banken's contactless card, Sweden

ICA Sverige and ICA Banken represent two organisations belonging to ICA Gruppen. ICA Sverige is a grocery retailer having the largest market share in Sweden. ICA Banken is a full-service bank that aims to ensure efficient and cheap payments to all ICA retailers.

ICA Sverige was the Swedish first retailer that opened up for NFC-based contactless payments. In 2015, ICA Banken offered contactless cards to all its customers. Micro-payments (below 250 SEK) do not require using PIN code. The contactless card is connected to retailer's loyalty programmes and online and mobile digital channels. Summary of the ICA Banken case is in Table 27.

Table 27. Summary of the ICA Banken case.

Criteria	**Description**
Provider(-s)	ICA Banken
Type of solution	Bank account-based PoS solution
Service/ Payment scenario	PoS payment integrated with loyalty programmes
Infrastructure	Use of the existing payment infrastructure and NFC-enabled terminals
Partner(-s)	ICA Sverige
Merchant network	ICA stores (focus); accepted by all merchants accepting contactless (NFC) payments
Customers	ICA Banken customers

7.2 Findings: Critical design issues

7.2.1 Service domain

Approaches to critical design issues are summarised in Table 28.

The ICA Banken's contactless card can be used at general market for payments at any retailer accepting contactless payments. The main target customer group is ICA customers. These customers can benefit the most from this solution used at ICA retail stores. Hence, both ICA customers and ICA retailers are the main target groups.

> *'We want to be 'The best bank for the ICA client.' … We want to create a bank offer that is unique in a connection to ICA and that's what nobody else can do'* (ICA Banken).

In this case, there are two types of customers: end users and merchants. Value provides to these customers is the following:

(i) *Clear value for end users*. The clear value to end users is an easy payment process for amounts below 250 SEK that is a convenient alternative to payments in cash. Additionally, this solution offers added value by integration with all digital ICA channels and loyalty programmes. With the help of a mobile app (ICA Handla) it is possible to see personalised offers and coupons, and download coupons to the contactless card. The solution offers faster payment process, reduced queuing and shopping time. Finally, the cost associated with the card is lower than in other banks.

> '*The ICA Banken card has been … relatively cheap for the clients, it has been a good travel card with no exchange rates fee, no fee of taking out [withdrawing] money, it has been a good insurance. … We wanted to make it a little bit better by introducing an NFC. This makes everyday a little bit easier for the clients. … It is based on doing everyday a little simpler by having easier and faster check-out option. It is also a complimentary to cash payments'* (ICA Banken).

(ii) *Clear value for merchants*. ICA retailers have a number of benefits related to the use of contactless cards. First of all, retailers seek to reduce the amount of cash. Contactless card helps to replace cash for small amounts.

> '*Cash payments is fine, but it is very expensive to take care. We can also see that more than 80% may be 90% of the contactless transactions are done under 250 SEK. Which means that the expectations of switching out cash to easy card payments is fulfilled. ... For high amounts this is not that distinctive'* (ICA Banken).

Contactless card also implies a faster customer service. This means that more customers can be served and this increases the retailer's revenues.

> '*If we decrease the amount of time that you spend at the PoS divided by every day divided by all the shops, it gets a lot of money. That is one of the reasons why we launched contactless cards. It makes it little faster for every transaction. ... And if you multiply time to every client, to every shop, to every day, to every week – we save a lot of time. However, like I said before, if you shop a lot, you have been here for an hour, it does not really matter if you chip-and-pin or swipe your card. That is not a big deal'* (ICA Banken).

The retailer integrated contactless cards with loyalty programmes and personalised offers. This helps to create customer loyalty.

> '*Now, the ICA store owners get a better understanding that an ICA Banken client is more loyal to ICA than any other bank's client. Clients get many things [proposals, personalised offers] and tend to be more loyal to ICA if they have a larger share of wallet within the ICA system'* (ICA Banken).

Finally, the mission of ICA Banken is to ensure cheap payment for ICA retailers, and use of own payment cards means lower transaction cost.

Table 28. Critical design issues in the service domain.

Description of factors	ICA Banken
Targeting	
General market	•
Niche market (ICA Sverige clients)	•
Consumers and retailers	•
Creating value elements	
(i) Clear value for end users:	
- Easy to use service, easy replacement for cash	•
- Added value services	•
- Avoiding queues, time saving, faster payment process	•
- Lower cost associated with a card	•
(ii) Clear value for ICA retailers:	
- Decreased amount of cash	•
- Faster customer service	•
- Integration with loyalty programmes	•
- Lower cost of payment	•
Branding	
Secure service	•
Positive impact to ICA Banken's brand	•
Mass media attention	•
Customer retention	
Service bundling	•
New functionalities, app updates	•
Personalisation	•

The contactless card is branded as secure. It is based on contactless MasterCard technology. One of aims to be first actor introducing contactless payments in the market was to improve ICA Banken's brand. This action helped to create image of more innovative and modern company. This also attracted a lot of mass media attention and created awareness.

> '*[Introduction of contactless cards] makes ICA Banken slightly more innovative, slightly more modern, helps ICA Banken to get a lot of press, saying, awareness in the market'* (ICA Banken).

In order to address customer retention, the retailer is focused on ways helping to create customer loyalty. Contactless cards offered a new service bundle to customers, that is integration of contactless card with retailer's loyalty programmes and online and mobile digital channels. One of the most convenient channels is the mobile ICA Handla app. It extends contactless card's functionalities by: (i) (i) downloading coupons to the card; (ii) showing bank account's balance; (iii) lists personalised available offers and bonuses; and (iv) provides a self-scanning and payment solution linked to ICA Banken card. The service provider constantly seeks to improve existing solutions.

> *'That is what we are working on constantly providing more functions for signing up to ICA, to handling your shopping with ICA Handla app, and so forth'* (ICA Banken).

7.2.2 Technology domain

Approaches to critical design issues are summarised in Table 29.

Table 29. Critical design issues in the technology domain.

Description of factors	ICA Banken
Security	
Easy to use service for customers and personnel	•
Full user identification	•
Contactless payments: no PIN code for small amounts, but random request to use PIN code	•
Quality of service	
Convenient and simple service	•
Integrated with retailer's loyalty programmes	•
Management of user profiles	
Bank manages users' bank account,	•
Retailer manages loyalty schemes and personalised offers	•
Service integration	
Contactless cards are interoperable and compatible with the existing payment infrastructure	•
NFC payment terminals were installed and enabled at all stores	•
Accessibility by customers	
ICA Banken customers	•

Contactless cards are easy to use for customers and cashiers. With this solution the user is fully identified. Solution does not require PIN code when paying amount below 250 SEK. However, for security reasons, there are random requests to enter PIN code.

> *'We do amount 250 kr without PIN code …. And regarding the security questions, you have theoretically larger risk explanation for that. Because in theory you, as a consumer, can lose your card in any way … and, in theory, you can have that burglar to have an open access to payments under 250 kr each time. … However, there are security hurdles on the backend, and we try to minimise the risk. And you on and off will be addressed to have your PIN code with you, but you never know. … Yes, there is a larger risk explanation in theory, but we have not seen anything negative so far. We have clients that perceive it as more risky'* (ICA Banken).

The service provider seeks to offer a high quality service that is easy to use, convenient, and connected to personalised loyalty offers.

In this case, the bank is managing bank accounts of customers and the retailer is handling Customer Relation Management (CRM) system related to loyalty accounts of users.

Contactless cards are based on standard MasterCard technology. These cards are interoperable and compatible with the existing payment infrastructure in Sweden and abroad. They can be used as contactless with NFC-enabled terminals, and as chip-and-pin cards in the terminals not having NFC functionality. All payment terminals support contactless payments.

Customers with ICA Banken accounts can use the service.

7.2.3 Organisation domain

Approaches to critical design issues are summarised in Table 30.

Unique combination or retailer's and bank's resources and assets does not require additional parties to enter the service network. The retailer operates about 1300 stores in Sweden and has own base of customers. The bank has the needed competence in offering payments and manages bank accounts of customers.

The actors aim to create a service for ICA and have created a closed service network.

The key actor is ICA Gruppen, a retailer. This actor governs the network, offers services to own customers.

Due to closed service network and two main actors, it is possible to conclude that the complexity of the network is relatively low.

Table 30. Critical design issues in the organisation domain.

Description of factors	ICA Banken
Partner selection	
Unique situation of retailer owning a bank	•
Network openness	
Network is closed	•
Network governance	
The retailer is the key actor orchestrating the network, owning customers	•
Network complexity	
Low level of network complexity	•

7.2.4 Finance domain

Approaches to critical design issues are summarised in Table 31.

Table 31. Critical design issues in the finance domain.

Description of factors	ICA Banken
Pricing	
Contactless card offers good service prices for end users	•
Retailers have cheaper payment system	•
Division of investments	
ICA Banken invested in service development, integration, and licensing	•
No investment from the side of ICA storeowners	•
Valuing contributions and benefits	
Based on agreement	•
Division of costs and revenues	
Revenues from increased volumes of digital transactions at lower cost	•
Revenues from increased sales	•
Decreased cash handling cost	•
Saved transaction fees paid by merchants to other banks	•

The contactless card provided by ICA Banken offers customers good prices compared to other banks. ICA retailers benefit from cheaper payment service when compared to use of cards of other banks.

The major investment in service development and launch was done by ICA Banken. ICA storeowners did not experience investment cost.

> *'What we [ICA Banken] did was to implement the software and regulations, and get licence for all that. The store owners did not do anything. We pushed the software remotely. We did a pilot to see if this works. We did some communication packages [explaining how everything works]'* (ICA Banken).

Valuation of benefits and contributions of involved parties is agreement based.

The retailer's revenues increase because of increasing volumes of digital transactions that have a lower cost. More efficient work of personal and faster customer services allows to increased sales and, consequently, revenues. Additionally, replacement of cash by contactless payments results in lower amount of cash and lower cost related to cash handling. Finally, increasing transactions with own ICA card helps to save transaction costs that otherwise would be paid to other banks.

8 MOBILE TICKETING SOLUTIONS PROVIDED BY PUBLIC TRANSPORT COMPANIES

8.1 Brief description of mobile ticketing services

I classify mobile ticketing service into four groups: SMS ticketing, in-app ticketing, Be In Be Out (BIBO) ticketing, and contactless bank card-based ticketing. Case studies are discussed in more details in Apanasevic and Markendahl (2017, 2018). A brief case summary is below.

8.1.1 SMS ticketing service

Description of SMS ticketing is based on two cases. In 2009, SMS ticketing was introduced in Sweden and Copenhagen. In order to buy a ticket, passengers had to send an SMS with a certain code. These payments were included in mobile phone bills. The service was targeting occasional travellers wishing to purchase a single ticket for a trip. The service is currently running in Copenhagen. In Sweden, due to a change of regulation, mobile operators could not continue offering this service starting from February 2013. New payment providers entered the market. Additionally, new rules required customer registration. This approach did not meet the support from passengers and volumes of SMS ticket sales substantially went down. Many public transport companies stopped offering SMS tickets after launch of in-app ticketing solutions. Summary of SMS ticketing is in Table 32.

Table 32. Summary of SMS ticketing.

Criteria	Description
Cases	(1) Unified SMS ticketing solution in Sweden (2) SMS ticketing solution in Copenhagen (Denmark)
Provider(-s)	Public transport companies
Type of ticket	Single ticket
Type of payment	Premium SMS, mobile operator billing (including SMS ticket in mobile phone bills)
Partner(-s)	Mobile network operators, technology solution providers
Customers	All passengers using any mobile phone (both feature and smart phones) Target customers – not frequent passengers buying single tickets

8.1.2 In-app ticketing service

Description of in-app ticketing is based on 12 cases implemented in five countries. First mobile ticketing apps appeared around 2013–14 and offered single tickets. Now, mobile apps offer full or almost full ticket assortment and opportunity to pay using different payment methods (see Table 32). The share of in-app ticket sales varies from case to case: *'(i) less than 10 per cent in Lithuania, Estonia, and the majority of Swedish regions in 2016; (ii) about 40 per cent of all single tickets and 17 per cent of all season passes in Copenhagen in 2015, and (iii) more than 50–60 per cent in Oslo and Bergen in Norway in 2016*' (Apanasevic and Markendahl, 2018).

Table 32. Summary of in-app ticketing.

Criteria	Description
Cases	(1) Bleningetrafiken, (2) Länstrafiken Kronaberg, (3) Skånetrafiken, (4) Västtrafik, (5) Karlstadsbuss, (6) SL (Sweden); (7) Ruter, (8) Skyss (Norway); (9) Copenhagen Metro and Movia (Denmark); (10) Ridango, (11) T grupp (Estonia); (12) Susisiekimo Paslaugos (Lithuania)
Provider(-s)	Public transport companies
Type of ticket	(i) Single tickets; (ii) A limited range of tickets; (iii) All range of tickets
Type of payment	Visa/MasterCard (Denmark, Estonia, Sweden, Norway), invoices (Sweden), mobile operator billing (Denmark, Estonia, Norway), mobile payment services (Denmark, Norway, Sweden), and electronic payment solution developed by banks (Lithuania, Estonia).
Partner(-s)	Mobile network operators, payment service providers, technology solution providers
Customers	Passengers having smart phones Target customers: (i) certain groups of passengers; (ii) all passengers

8.1.3 BIBO ticketing service

Description of BIBO ticketing is based on two cases (see Table 33). New development in mobile ticketing is BIBO systems. These solutions use iBeacons and micro-location technology (Apanasevic and Markendahl, 2018). The main idea behind the service is: the system identifies when the passenger enters the bus and automatically starts mobile ticket app on the smartphone. When the passenger leaves the bus, the mobile ticket is stopped. In order to use this service, the passenger needs to turn on Bluetooth on the smartphone. This solution registers exact use of the public transport and based on that automatically bills passengers. Pilots of such solutions are running in Oslo, Tallinn, and Tartu (Apanasevic and Markendahl, 2018).

Table 33. Summary of BIBO ticketing.

Criteria	Description
Cases	(1) Ruter (Norway) (2) Jiffi (Estonia)
Provider(-s)	Public transport company (Ruter), Technology solution provider (Jiffi)
Type of ticket	Registration of the exact use of the public transportation
Type of payment	Any type of payment can be used
Partner(-s)	Payment service providers, technology solution providers
Customers	Passengers having smart phones Target customers: all passengers

8.1.4 Contactless payment cards in public transport ticketing

Transport for London (TfL) used contactless payment cards for public transport ticketing in London. The solution based on MasterCard contactless payment technology was launched in September 2014 (MasterCard, 2017). The idea behind this solution is the following: passengers '*touch special readers with contactless card or device when they enter and leave the transport system*' (Apanasevic and Markendahl, 2018). Then, there is a daily or weekly (Monday to Sunday) price capping – this is a calculation of the best price for all travels. Summary is provided in Table 34.

Table 34. Summary of contactless payment card-based ticketing.

Criteria	Description
Cases	Transport for London (the UK)
Provider(-s)	Public transport company
Type of ticket	'Pay as you go' and former 'seven-day Travelcards'
Type of payment	Contactless payment cards with daily or weekly capping
Partner(-s)	MasterCard, technology solution providers, payment service providers
Customers	City guests, passengers previously using 'Pay as you go' or 'seven-day Travelcards'

8.2 Findings: Critical design issues

In mobile ticketing cases, findings represent aggregated data based on a number of cases, as described above. I put a dot in the tables on critical design issues if I observed used approach at least in one case.

8.2.1 Service domain

Approaches to critical design issues are summarised in Table 35.

A certain mobile ticketing solution is usually available for all passengers using public transportation in a certain city or a region. Within this city of region, mobile ticketing is offered in the general market. This is true for all types of mobile ticketing. Despite being available for all types of passengers, some services additionally target specific groups of passengers. One example is SMS ticketing that targets non-frequent passengers and youth. Another example is contactless ticketing that targets passengers that used to 'pay-as-you-go', former 'seven-day Travelcard' users, and tourists.

Table 35. Critical design issues in the service domain.

Description of factors	SMS	In-app	BIBO	Contactless
Targeting				
General market	•	•	•	•
Non-frequent passengers, youth	•			
Non-frequent passengers, city guests				•
Creating value elements				
(i) Clear value for end users:				
- Easy and convenient way to buy a ticket	•	•	•	•
- Allows spontaneous travel	•	•	•	•
- Mobile tickets are available any time and anywhere	•	•		
- Different payment methods		•	•	
- Small ticket assortment	•	•		•
- Wider ticket assortment offering		•		
(ii) Clear value for public transport company:				
- Enhanced technical functionality		•	•	•
- Lower service cost		•	•	•
- Increased sales and travelling	•	•		•
- Safer working environment	•	•		
- Efficient transport operation		•	•	
- Closer relationship with customers		•		
Branding				
Positive impact to public transport company's brand		•		
Customer retention				
New service bundles		•		•
New functionalities		•	•	
Personalisation		•	•	•

All types of mobile ticketing are easy and convenient for customers to use and fit well in the situation of spontaneous trip. SMS and in-app tickets are independent on time and location.

> *'It is extremely easy for the customers to buy a ticket whenever and wherever they want to'* (Västtrafik).
>
> *'Mobile ticketing makes it easy to buy tickets no matter where customers are from'* (Skånetrafiken).
>
> *'We were looking into the young people if that [SMS ticketing] would be a way to increase their use of public transport. And it actually increased the rate among young people'* (Movia).

Majority of in-app and BIBO ticketing services offer customers a range of payment methods, for example, in #Ruter app a customer can choose between Visa/MasterCard, operator billing, and mobile payment service. SMS ticketing was offering single tickets, and this was considered as one of its main disadvantages. From this perspective, the benefit of in-app ticketing is a bigger choice of tickets.

> '*Another thing is that when you have an app you have a bigger choice of tickets*' (Copenhagen Metro).

Results of research on value of mobile ticketing to public transport company are presented in Apanasevic and Markendahl (2018). Based on findings of this research, the following categories of value were identified: (i) enhanced technical functionality cost (in-app, BIBO, contactless); (ii) lower service cost (in-app, BIBO, contactless); (iii) increased sales and travelling (SMS, in-app, contactless); (iv) safer working environment for bus drivers because reduced amount of cash reduced possibility of robbery (SMS, in-app); (v) efficient transport operation (in-app, BIBO); and (vi) closer relationship with customers (in-app).

Introduction of mobile ticketing makes a positive impact on the brand of public transport company.

New types of mobile ticketing offer new service bundles. For example, TfL introduced contactless card is bundled with price capping and online user accounts; majority of in-app ticketing offer a range of new services, such as route planning, travel information, combined mobility. In-app ticketing integrated new functionalities, for example, reminders, ticket sharing, and trip evaluation. BIBO ticketing seamlessly handles activation and deactivation of mobile ticket. Use of mobile apps and contactless cards enables personalisation of the service (in-app, BIBO, contactless).

8.2.2 Technology domain

Approaches to critical design issues are summarised in Table 36.

Table 36. Critical design issues in the technology domain.

Description of factors	SMS	In-app	BIBO	Contactless
Security				
Easy to use	•	•	•	•
Anonymous users			•	
Some degree of user identification	•	•		
Full user identification				•
Ticket security issues	•			
More measures to protect security		•		
No PIN for contactless payments				•
Issues with 3D payment card security in some apps		•		
Quality of service				
Convenient and simple service	•	•	•	•
Worse travelling statistics	•	•		
Not 100% reliable service	•			
Discharging phone battery		•		
Smartphone characteristics			•	
Management of user profiles				
Technical solution provider manages accounts of registered users	•	•	•	•
Public transport companies access accounts of registered users		•	•	•
Service integration				
Ticketing system integrated with MasterCard contactless technology				•
Ticketing system integrated with payment provider's systems	•	•	•	•
Installation of specific hardware (if needed)		•	•	•
Joint development of mobile ticketing (e.g. single standard)		•		
Accessibility by customers				
Service for non-frequent travellers	•	•		•
Service for all passengers		•	•	
Some customer groups can be excluded	•	•	•	•

All types of mobile ticketing services are easy for passengers to use. BIBO solutions allow full passengers' anonymity. SMS and in-app ticketing provide some degree of user identification: phone number in the case of SMS, and phone number and payment card details in the case of in-app ticketing. Full user identification is in the case of ticketing based on contactless bank card.

In terms of security, SMS tickets are easy to fake. From this perspective, in-app ticketing provides more measures to ensure security (e.g. changing daily words or colours, animations, and holograms).

> '*If people have the right ticket, and if the daily picture is ok, then everything is set. It is quite hard to copy it [the ticket] in any way'* (Ruter).

> '*There is a daily word and a daily colour behind the ticket when you press on the ticket. <…> It changes everyday <…> there is a QR-code that they [ticket inspectors] can check. <…> In the addition to that, there also is a number code that is extremely difficult to hack. We have not experienced any fraudulent tickets so far*' (Skyss).

> '*In the app, there is a hologram that moves <…> and that is a colour that changes. There are certain measures to make sure that people cannot cheat*' (Copenhagen Metro).

In the case of TfL, contactless payments do not require entering PIN code, however, the service implies low volume payment, as the service is used for 'pay-as-you-go' approach. In some cases, in-app solutions have issues with 3D security of registered bank card.

> '*3D security does not work very well on mobile phones. We have, unfortunately, a lot of credit card fraud*' (Ruter).

> '*We have unfortunately had quite a lot of fraudulent behaviour on credit cards*' (Copenhagen Metro).

Mobile ticketing services are convenient and simple. The issue of SMS and in-app ticketing is these solutions do not provide travel statistics. This information is the key when planning transport routs. At the same time, card-based ticketing systems provide statistics on travelling. Installation of mobile ticket validating equipment (Karlstadsbuss, Skånetrafiken) or introduction of buses with passengers' counting systems (Vilnius City Councilor) are seen as possible solutions.

> '*For us it would probably be better if people were using the cards, as we get a better statistics*' (Karlstadsbuss).

> '*Today, the ticket control is only a bus driver that looks at the ticket if it looks ok. But Skånetrafiken has to develop machines for ticket validation. Then it will be possible to have access to data and know where the exact traveller is travelling with a ticket. Today, Skånetrafiken does not really know this data*' (Skånetrafiken).

> '*The advantages with the travel card <…> we get a lot data statistics on the customer use, and so on. That is why we want people to move from mobile ticket to the travel card*' (Movia).

SMS ticketing is not 100 per cent reliable and customers may not receive their ticket.

> '*We hope that we have delivered a ticket, but we actually do not. <…> the reliability is high, but it is not a 100%*' (Copenhagen Metro).

Discharging phone battery is the biggest disadvantage of in-app ticketing.

> '*Last year it was up to 19% [of customers] that did not want to use their mobile phone because of being frighten of losing all power on their mobile phone*' (Ruter).

> '*And if you run out of the battery on your phone that means that you cannot show it. That is an issue for some users … These types of customers still like to use the traditional plastic card*' (Skyss).

> '*One more disadvantage is that phone's battery can discharge*' (Susisiekimo paslaugos).

Smartphone characteristics may change and cause issues in the case of BIBO ticketing.

> '*Any new smartphone coming to the market can have some kind of a system or settings that creates problem in mobile ticketing*' (Jiffi).

Management of user data is performed by technology solution provider. Public transport companies have a software to see accounts of users registered in the mobile ticketing system (in-app, BIBO, contactless). This information is needed during ticket control. Inspectors can access the database and see all ticket and phone details.

Mobile ticketing solution should be integrated with two systems: public transport ticketing system and payment service providers' system. For example, ticketing system's integration with MasterCard contactless technology (TfL), mobile operator billing, or different types of payment methods (bank card, mobile payment, invoice, etc.) in the app. Ticketing services might require special infrastructure: optical readers in the case of in-app ticketing, iBeacons in the case of BIBO ticketing, readers in the case of contactless payment card ticketing.

> '*One of the things that we are looking into is to have machine validating [mobile] tickets … Then you would be able to get more statistics, more date from mobile ticket travels*' (Karlstadsbuss).

In order to develop interoperable mobile ticketing solutions and to be able to validate tickets of other public transport companies, 24 public transport companies in Sweden collaborated, and together with Samtrafiken, public transport authority, developed a single standard for mobile ticketing solutions. A number of public transport companies in Norway agreed to collaborate and together develop mobile ticketing.

Some types of mobile ticketing services target certain groups of passengers: non-frequent users are targeted by SMS, some in-app services, and contactless ticketing. At the same time, some in-app and BIBO ticketing services target all types of passengers. There are also certain groups of customers that can be excluded from the service. One example is SMS tickets that are not available for tourists with foreign mobile phone numbers. Another example is in-app and BIBO ticketing that are not available for feature phones users.

8.2.3 Organisation domain

Approaches to critical design issues are summarised in Table 37.

Table 37. Critical design issues in the organisation domain.

Description of factors	SMS	In-app	BIBO	Contactless
Partner selection				
Contracts with technology solution providers and payment service providers	•	•	•	•
Network openness				
Network is opened	•	•	•	•
Network governance				
Public transport company is the key actor orchestrating the network, owning customers	•	•	•	•
Network complexity				
High level of network complexity	•	•	•	•

In the cases of all mobile ticketing services, public transport companies need to contract a technology solution provider and a payment service provider. Actors and roles that are performed in different service networks are presented in Table 38.

Table 38. Actors and roles in value networks of different ticketing services.

	Actor	
Role	**SMS ticketing**	**In-app, BIBO and contactless ticketing**
Public transport company	Public transport company	Public transport company
Technical solution provider	SMS aggregators and ticket provider: IT company	Solution developer: IT company or Own technical department
Payment service provider	Mobile network operator billing	Payment processors, mobile operator billing providers, banks
Bank		Bank

Main roles and actors in SMS-based ticketing solution are:

(i) *Public transport company* provides public transportation services and contracts actors needed to provide SMS ticketing service.

(ii) *SMS aggregator and ticket provider*. These are companies that provide technological SMS aggregation and ticketing solution, and aggregate SMS ticket requests, generate and deliver SMS tickets to customers. Pliusdial (Finland), UnWire (Denmark), and Mobill (Sweden) are established companies specialising on SMS aggregation services. These three companies operated in Sweden and collaborated with different public transport companies in different regions. UnWire solutions was used in Copenhagen.

(iii) *Payment service providers*. This role is performed by mobile network operators that handle end-user billing.

Main roles and actors in in-app, BIBO, and contactless bank card-based ticketing solutions are:

(i) *Public transport company* provides public transportation services and contracts actors needed to provide in-app ticketing service.

(ii) *Technical solution provider*. These are companies that provide technological solution, and connect mobile ticketing solution to the database of public transport company. In some cases (Ruter), this is own technical department of public transport company.

(iii) *Payment service providers*. This role is performed by payment processors (Nets, Klarna, Dibs in Scandinavian market), banks in Estonia and Lithuania, and mobile operators (Denmark, Norway). The main role of these actors is to handle payments.

(iv) *Banks* perform clearing and settlement of bank card payments.

Networks of mobile ticketing at some point in time are opened. At this time, public transport companies announce procurement of new ticketing system. Selection of partners is based on received proposals. Actors that submitted the best proposals get terminated contracts.

A public transport company is the key actor in the value network. It organises a service value network and governs it.

Public transport companies usually offer different types of ticketing services simultaneously. This means that a value network usually involves a big number of different actors and is very complex.

8.2.4 Finance domain

Approaches to critical design issues are summarised in Table 38.

Majority of public transport companies perceive RFID (Radio-Frequency IDentification) smart cards as cheaper in use, having a better security, less fraudulent, and providing a better travel statistics solution (Apanasevic and Markendahl, 2017). Hence, in majority of cases, mobile tickets are more expensive than tickets on pre-loaded smart card. At the same time, it is more expensive to handle cash when compared to cost of in-app and contactless ticketing.

A public transport company takes responsibility and makes investment in a mobile ticketing system.

Evaluation of benefits and contributions of participating parties is based on contracts.

Main revenues come from sold mobile tickets. In some cases, the share of mobile tickets is rather small (less that 10 per cent). However, interviewed public transport companies expect growth. Additionally, there is a decrease in cash handling costs. Costs that experience public transport companies are related to fees paid to actors involved in value network.

Table 38. Critical design issues in the finance domain.

Description of factors	SMS	In-app	BIBO	Contactless
Pricing				
Mobile tickets are more expensive than tickets on RFID cards	•	•	•	
Division of investments				
A public transport company makes all investment	•	•	•	•
Valuing contributions and benefits				
Based on agreement	•	•	•	•
Division of costs and revenues				
Revenues from mobile ticket sales	•	•	•	•
Decreased cash handling cost	•	•	•	•
Commissions paid to partners	•	•	•	•

9 CONCLUDING REMARKS

The main aim of this report is to present primary data for implemented study on approaches of service providers towards mobile payment services. This report seems to address the exploratory part of research and to answer the question: *What factors stimulate and hinder the introduction of mobile payments?*

In order to show all variety of approaches used by service providers, I have structured the primary data using STOF model. Primary data structured and classified by critical design factors can be used for further analysis and serve for purposed of explanatory part of research. Additionally, other researchers can use this data as it gives a picture on strategies and approaches of different service providers.

REFERENCES

Allee, V., 2000. Reconfiguring the value network. *Journal of Business Strategy*, 21(4), pp. 36–39.

Allee, V., 2008. Value network analysis and value conversion of tangible and intangible assets. *Journal of Intellectual Capital*, 9(1), pp. 5–24.

Apanasevic, (forthcoming, 2018). Opportunities and challenges of mobile payment services: The perspective of service providers. PhD thesis, KTH Royal Institute of Technology.

Apanasevic, T. and Markendahl, J., 2017. Mobile ticketing services in the Northern Europe: Critical business model issues. In: *Proceedings of Joint CTTE and CMI Conference 2017: Internet of Things – Business Models, Users, and Networks,* Copenhagen, Denmark, 23–24 November 2017.

Apanasevic, T. and Markendahl, J., 2018. Value of mobile ticketing services: Perspective of public transport companies. *Journal of Payment Strategy & Systems*, 11(4), pp. 292–305.

Au, Y.A. and Kauffman, R.J., 2008. The economics of mobile payments: Understanding stakeholder issues for an emerging financial technology application. *Electronic Commerce Research and Applications*, 7(2), pp. 141–164.

Balasubramanian, S., Peterson, R.A., and Jarvenpaa, S.L., 2002. Exploring the implications of m-commerce for markets and marketing. *Journal of the Academy of Marketing Science*, 30(4), pp. 348–361.

Boden, R., 2015. Norway's Valyou NFC wallet to shut down due to lack of user adoption. *NFC World*, [online] 18 November. Available at: <http://www.nfcworld.com/2015/11/18/339757/norways-valyou-nfc-wallet-to-shut-down-due-to-lack-of-user-adoption/> [Accessed 9 July 2016]

Bouwman, H., Haaker, T., and De Vos, H., 2008. *Mobile service innovation and business models*. New York: Springer.

Brakewood, C., Rojas, F., Rodin, J., Sion, J., and Jordan, S., 2014. Forecasting mobile ticketing adoption on commuter rail. *Journal of Public Transportation*, 17(1), pp. 1–19.

Chen, L.D. and Nath, R., 2004. A framework for mobile business application. *International Journal of Mobile Communications*, 2(4), pp. 368–381.

Cheng, Y.H. and Huang, T.Y., 2013. High speed rail passengers' mobile ticketing adoption. *Transportation Research Part C*, 30, pp. 143–160.

Clark, S., 2014. O2 UK to shut down mobile wallet service. *NFC World*, [online] 9 January. Available at: <http://www.nfcworld.com/2014/01/09/327453/o2-uk-shut-mobile-wallet-service/ [Accessed 30 March, 2015]

Clarke, I. III, 2001. Emerging value propositions for m-commerce. *Journal of Business Strategies*, 18(2), pp. 133–148.

Dahlberg, T., Bouwman H, Cerpa, N., and Guo, J., 2015a. M-Payment – How disruptive technologies could change the payment ecosystem. In: *Proceedings of the 23d European Conference on Information Systems (ECIS)*, Münster, Germany, 2015.

Dahlberg, T., Huurros, M., and Ainamo, A., 2008a. Lost opportunity – Why has dominant design failed to emerge for the mobile payment services market in Finland? In: *Proceedings of the 41st Hawaii International Conference on System Sciences (HICSS),* Waikoloa, USA, 2008.

Dahlberg, T., Guo, J., and Ondrus, J., 2015b. A critical review of mobile payment research. *Electronic Commerce Research and Applications*, 14(5), pp. 265–284.

Dahlberg, T., Mallat, N., Ondrus, J. and Zmijewska, A., 2008b. Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Applications*, 7(2), pp. 165–181.

de Reuver, M., Verschuur, G., Nikayin, F., Cerpa, N., and Bouwman, H., 2015. Collective action for mobile payment platforms: A case study on collaboration issues between banks and telecom operators. *Electronic Commerce Research and Applications*, 14(5), pp. 331–334.

Di Pietro, L., Guglielmeti Mugion, R., Mattia, G., Renzi, M.F., and Toni, M., 2015. The integrated model on mobile payment acceptance (IMMPA): An empirical application to public transport. *Transportation Research Part C*, 56, pp. 463–479.

Eisenhardt, K.M., 1989. Building theories from case study research. *The Academy of Management Review*, 14(4), pp. 532–550.

Eisenmann, T., Parker, G., and Van Alstyne, M.W., 2006. Strategies for two-sided markets. *Harvard Business Review,* 84(10), pp. 92–110.

Evans, D.S. and Schmalensee, R., 2008. Markets with two-sided platforms. *Issues in Competition Law and Policy (ABA Section of Antitrust Law),* 1, Chapter 28, pp. 667–693.

Fortumo, 2017. *Ooredoo and Fortumo extended carrier billing partnership to Myanmar*. [online] Press release, 7 December. Available at: <https://fortumo.com/press/ooredoo-fortumo-extend-carrier-billing-partnership-myanmar/> [Accessed 21 December 2017]

Ghezzi, A., Renga, F., Balocco, R., and Pescetto, P., 2010. Mobile payment applications: Offer state of the art in the Italian market. *Info*, 12(5), pp. 3–22.

GSMA, 2014. *2014 State of the industry: Mobile financial service for the unbanked.* GSMA, Mobile Money for the Unbanked. [pdf] Available at: <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2015/03/SOTIR_2014.pdf> [Accessed 30 March 2015]

GSMA, 2016. *The mobile economy*. [pdf] Available at: http://www.gsma.com/mobileeconomy/archive/GSMA_ME_2016.pdf [Accessed 18 May 2017]

Guo, J. Nikou, S., and Bouwman, H., 2013. Analyzing the business model for mobile payment from bank perspective: An empiric study. In: *Proceedings of the 24th European Regional Conference of the International Telecommunication Society (ITS)*, Florence, Italy, 20-23 October 2013.

Guo, J. and Bouwman, H., 2016. An ecosystem view on third party mobile payment providers: A case study of Alipay wallet. *Info*, 16(5), pp. 56–78.

Haaker, T., Faber, E., and Bouwman, H., 2006. Balancing customer and network value in business models for mobile services. *International Journal of Mobile Communications*, 4(6), pp. 645–661.

Hedman, J. and Henningsson, S., 2015. The new normal: Market cooperation in the mobile payment ecosystem. *Electronic Commerce Research and Applications,* 14(5), pp. 305–318.

Hedman, J. and Kalling, T., 2003. The business model concept: Theoretical underpinnings and empirical illustrations. *European Journal of Information Systems*, 12(1), pp. 49–59.

Heinonen, K. and Pura, M., 2008. Classifying mobile services. In: *Proceedings of the Helsinki Mobility Roundtable,* 1-2 June 2006, Helsinki, Finland.

Juntunen, A., Tuunainen, V.K., and Luukkainen, S., 2012. Critical business model issues in deploying NFC technology for mobile services: Case mobile ticketing. *International Journal of E-Services and Mobile Applications*, 4(3), pp. 23–41.

Kakihara, M. and Sørensen, C., 2002. Mobility: An extended perspective. In: *Proceedings of the 35st Annual Hawaii International Conference on System Sciences*, 10 January 2002, Big Island, USA.

Kazan, E. and Damsgaard, J., 2013. A framework for analyzing digital payment as a multi-sided platform: A study of three European NFC solutions. In: *Proceedings of the 21st European Conference on Information Systems (ECIS)*, Utrecht, The Netherlands.

Komulainen, H., Mainela, T., Tähtinen, J. and Ulkuniemi, P., 2007. Retailers' different value perceptions of mobile advertising service. *International Journal of Service Industry Management*, 18(4), pp. 368–393.

Lapierre J., (1997). What does value mean in business-to-business professional services? *International Journal of Service Industry Management*, 8(5), pp. 377–397.

Liu, J., Kauffman, R.J., and Ma, D., 2015. Competition, cooperation, and regulation: Understanding the evolution of the mobile payments technology ecosystem. *Electronic Commerce Research and Applications*, 14(5), pp. 372–391.

Mallat, N., 2007. Exploring consumer adoption of mobile payments – A qualitative study. *Journal of Strategic Information Systems*, 16(4), pp. 413–432.

Mallat, N., Rossi, M., Tuunainen, V.K., and Öörni, A., 2009. The impact of use context on mobile service acceptance: The case of mobile ticketing. *Information and Management*, 46(3), pp. 190–195.

Mallat, N. and Tuunainen, V.K., 2008. Exploring merchant adoption of mobile payment systems: An empirical study. *e-Service Journal*, 6(2), Winter 2008, pp. 24–57.

Markendahl, J., 2013. Change of market structure for mobile payments services in Sweden – the case of SMS tickets. In: *Proceedings of the 12th International Conference on Mobile Business (ICMB),* Berlin, Germany, 10-13 June 2013.

MasterCard, 2017. *Contactless payments travel well in London*. [pdf] Case Study, Available at: <https://www.mastercard.us/content/dam/mccom/en-us/documents/transport-for-london-case-study-april-2017.pdf> [Accessed 11 August 2017]

McCarty, M.Y. and Bjaerum, R., 2013. *Easypaise: Mobile money innovation in Pakistan*. GSMA, Mobile Money for the Unbanked. [pdf] Available at: <http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2013/07/Telenor-Pakistan.pdf> [Accessed 9 July 2016]

McKinsey, 2016. *Digital finance for all: Powering inclusive growth in emerging economies*. McKinsey & Company, New York, NY.

Nielsen, J., 2013. *Conversion rates*. [online] Available at: <https://www.nngroup.com/articles/conversion-rates/> [Accessed 22 December 2017]

Nysveen, E.A., 2017. Over 100 banker går sammen om Vipps. [online] *e24*, 13 February. Available at: <https://e24.no/boers-og-finans/dnb/over-100-banker-gaar-sammen-om-vipps/23923272> [Accessed 22 January 20187]

Ondrus, J., Gannamaneni, A., and Lyytinen, K., 2015. The impact of openness on the market potential of multi-sided platforms: A case study of mobile payment platforms. *Journal of Information Technology,* 30(3), pp. 260–275.

Ondrus, J., Lyytinen, K., and Pigneur, Y., 2009. Why mobile payments fail? Towards a dynamic and multi-perspective explanation. In: *Proceedings of the 42nd Hawaii International Conference on System Sciences (HICSS*), Big Island, USA, 2009, IEEE.

Ozcan, P. and Santos, F.M., 2015. The market that never was: Turf wars and failed alliances in mobile payments. *Strategic Management Journal,* 36(10), pp. 1486–1512.

Pateli, A.G. and Giaglis, G.M., 2004. A research framework for analyzing eBusiness models. *European Journal of Information Systems*, 13(4), pp. 302–314.

Pousttchi, K., 2008. A modeling approach and reference models for the analysis of mobile payment use cases. *Electronic Commerce Research and Applications*, 7(2), pp. 182–201.

Pousttchi, K., Schiessler, M., and Wiedemann, D.G., 2009. Proposing a comprehensive framework for analysis and engineering of mobile payment business models. *Information Systems and E-Business Management,* 7(3), pp. 363–393.

Ryschka, S., Tonn, J., Ha, K.H., and Bick, M., 2014. Investigating location-based services from a business model perspective. In: *Proceeding of the 47th Hawaii International Conference on System Science (HICSS)*, Waikoloa, USA, 6-9 January 2014, pp. 1173–1182.

Smart, n.d. *What is Smart Money*. [online] Available at: <http://smart.com.ph/Money/what-is-smart-money> [Accessed 9 July 2016]

Sparebank 1, 2017. *mCASH stenges ned fra 01.09.2017*. [online] June 30. Available at: <https://nyheter.mcash.no> [Accessed 16 January 2018].

Staykova, K.S. and Damsgaard, J., 2015. The race to dominate the mobile payments platform: Entry and expansion strategies. *Electronic Commerce Research and Applications,* 14(5), pp. 319–330.

Swedbank, 2013. *Betala med kort i mobilen hos Willys och Hemköp*. [online] Press release, 24 June, 2013. Available at: <http://www.swedbank.se/om-swedbank/press/pressmeddelanden/index.htm?pressId=784969> [Accessed 25 January 2014]

Swipp, 2017. *Swipp lukker pr. 28 februar 2017*. [online] Available at: <https://swipp.dk> [Accessed 15 January 2018]

SvD, 2014. Swedbank lägger ned betallösningen Bart. *SvD Näringsliv*, [online] 21 January. Available at: <http://www.svd.se/naringsliv/swedbank-lagger-ned-betallosningen-bart_8913772.svd> [Accessed 25 January 2014]

Vanhaverbeke, W. and Cloodt, M., 2005. Open innovation in value networks. In: Chesbrough, H., Vanhaverbeke, W., and West, J., eds. 2006. *Open innovation: Researching a new paradigm*. Oxford: Oxford University Press. Ch.13.

Yin, R.K., 2009. *Case Study Research: Design and Methods*, 4th ed. Thousand Oaks, CA: Sage.

Zhong, J. and Nieminen, M., 2015. Resource-based co-innovation through platform ecosystem: experiences of mobile payment innovation in China. *Journal of Strategy and Management*, 8(3), pp. 283–298.

Welch, C., 2015. Softcard is shutting down on March 31st, and Google Wallet will replace it. *The Verge*, [online] 5 March. Available at: <http://www.theverge.com/2015/3/5/8152801/softcard-shutting-down-march-31> [Accessed 9 July 2016]

APPENDIX A

Sample Interview Protocol

With a public transport company

1. Welcoming part: introductory part, explaining of research aims, asking permission to record the interview.

2. The history of mobile ticketing service(-s) development and service(-s) characteristics

- When was the mobile ticketing service(-s) introduced? and Why? What types of tickets can be bought with this solution? What are the payment options?
- Who were the main partners? What were their roles and responsibilities? How was the payment organised?
- How do you ensure service security?
- Was there any investment in service infrastructure / terminals needed?

3. What are the main advantages of mobile ticketing for transport company?

4. What were the initial expectations about mobile ticketing before its deployment? Did they prove? What are the disadvantages?

5. Use of the mobile app service in comparison to card, and other types of ticket

- How was the awareness created?
- What is the use trend among different types of tickets? (e.g. mobile app ticket vs. card) Is the price of different types of tickets the same?
- Is there a big interest from customers? Do they find it attractive? What are the main comments/feedback of customers using the solution? Does it meet their expectations? Do they ask for more functionality?

6. What are the future plans?

7. Closing part.

Appendix B

Table B.1: Details of interviews.

Case, Provider	Interviewee	Time of interview
Sweden		
	Adviser at Riksbanken	June 2016
Bart, Swedbank	Former Bart service developer, Swedbank	March 2014
SEQR, Seamless	Middle-level manager at Seamless	March 2014
	Middle-level manager at Axfood	March 2014
	Middle-level manager at McDonald's (written response)	October 2014
ICA card, ICA Banken	Middle-level manager at ICA Banken	December 2015
WyWallet	Middle-level manager at WyWallet	15 April 2016; 20 April 2016
Swish, GetSwish	Member of the board for Swish	June 2016
Mobile ticketing solutions	Middle-level manager at Bleningetrafiken	January 2016
	Middle-level manager at Skånetrafiken	February 2016
	Middle-level manager at Länstrafiken Kronaberg	February 2016
	Middle-level manager at Karlstadsbuss	March 2016
	Middle-level manager at Västtrafik	March 2016; June 2016
	Middle-level manager at SL	June 2016
	Middle-level manager at Samtrafiken	June 2016
	Middle-level manager at PayEx	April 2016
Norway		
	Industry expert from Norway	January 2017
Valyou, TSM Nordic and Vipps, DNB Bank	Former top-level manager at Valyou wallet	April 2012
	Former middle-level manager at DNB bank	April 2012
	Top-level manager at DNB bank	April 2016
	Middle-level manager at DNB bank	April 2016
	Former top-level manager at Valyou wallet	April 2016
	Former middle-level manager at TSM Nordic	April 2016
MeaWallet	Middle-level manager at MeaWallet	April 2016
Mobile ticketing solutions	Middle-level manager at Ruter	20 April 2016; 29 April 2016
	Middle-level manager at Skyss	June 2016
Denmark		
	Industry expert from Denmark	June 2016
MobilePay, Danske Bank	Middle-level manager at DanskeBank	June 2016
Mobile ticketing solutions	Middle-level manager at Copenhagen Metro	June 2016
	Middle-level manager at Movia	June 2016
The UK		
	Industry expert from the UK	May 2016
Estonia		
Fortumo, Fortumo	Top-level manager at Fortumo	May 2016
Mobile ticketing solutions	Top-level manager at T-piliet, Jiffi, T-Solutions	April 2016
	Middle-level manager at Ridango	May 2016
Lithuania		
	Five (5) board members of the Bank of Lithuania	May 2016
Mokipay, Antigravity Payment Systems	Top-level manager at Mokipay	January 2016
Paysera, Paysera	Top-level manager at Paysera	March 2016
WioPay, WoraPay	Top-level manager at WoraPay	May 2016
Mobile ticketing solution mTicket	Middle-level manager at Susisiekimo paslaugos	March 2016
	Middle-level manager at Bite Lietuva, a mobile network operator	March 2016
	Vilnius City Councilor (2011–15), initiator of 'Smart Vilnius' project	March 2016