Digitization of the payment Value-Added Services in the Netherlands

A Value Sensitive Approach

MSc. Thesis Razvan Halbac

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Digitization of the payment Value Added Services in the Netherlands

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In Management of Technology
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By
Mr. Razvan Halbac
Student number: 4319052
COHORT: 2013-2015

Graduation Committee

Chairman: Prof. Dr. Jeroen van den Hoven
Department: Values, Technology and Innovation
Section: Ethics/Philosophy of Science
TU Delft – Delft University of Technology

First Supervisor: Asst. Prof. Dr. ir. Udo Pesch
Department: Values, Technology and Innovation
Section: Ethics/Philosophy of Science
TU Delft – Delft University of Technology

Second Supervisor: Asst. Prof. Drs. Jolien Ubacht
Department: Engineering Systems and Services
Section: Information and Communication Technology
TU Delft – Delft University of Technology

Company Supervisor: MSc. Hugo Reijkens
Banks Market – Advisory Services
UL, Transaction Security division
Preface

The current research represents the final step in completing my master degree study in Management of Technology. There are several people, both from the academic and business world which I would like to acknowledge for their contribution to the following chapters.

To begin with I would like to express my gratitude towards my first supervisor, Udo Pesch. Not only has he initially raised my interest in the social aspects of technology during one of my first courses at TU Delft, but he also helped me find an approach for my graduation topic and guided me patiently throughout my research efforts. Besides his knowledge, his enthusiasm towards my research topic helped me overcome the inevitable bottlenecks present in any research process. The flexibility to shape my own my research design and the support he showed to this end are important factors which made developing my thesis a very pleasant and engaging experience until the very end.

Next I would like to thank Jolien Ubacht, my second supervisor. Her impressive and critical attention to details helped me deliver my very best out of my thesis report, while her analytical and structured approach came of aid countless times when I had difficulties shaping my thoughts and ideas into proper academic content. Also, much appreciated is the availability and patience she showed during the very early stages of my research, when I had only a broad topic and no idea how I can approach it.

My research was conducted in the Transaction Security division of the UL Corporation. This division is specialized in payment technologies and is located in the city of Leiden, the Netherlands. During my six month internship here I have had the pleasure of working with a lot of wonderful professionals, which have always been more than supportive towards my research and immersion in the payment industry. I would like to thank all of them, but a special big thank you goes to my internal supervisor, Hugo Reijkens which first of all made this project possible. The support, trust and patience that he showed towards my research efforts have made my internship a very enjoyable experience which I will always value. His professionalism, specialized knowledge, and overall way of conducting projects have opened up my curiosity and passion towards this dynamic and innovative industry, in which I would like to further specialize in my career.

Overall, the entire experience of studying at Delft University of Technology has been an amazing exploratory journey which has not only taken me on new peaks of professional development, but has also opened my eyes and completed me on a human and personal level. None of this would have been possible without the help and support of my beloved family. So I would like to express my gratitude towards my mother, father, sisters and Anca who have always been there for me, unconditionally, during the best but also the most difficult of moments.

Razvan Halbac,

October 2015, Delft
Executive Summary

The digital age we are currently living in, with its exciting innovations in the Information and Communication technology field, has opened up new business models, created new services and opportunities for companies and their consumers. One industry reflecting very well this digital transformation is the payment and banking industry: consumers nowadays have new payment instruments besides cash, ranging from debit and credit cards to mobile and online payment instruments. They also conduct their banking activities more and more from their own homes, in the online environment, as opposed to several years ago when everything needed to be done in the headquarters of the banks. This is an indicator that retail banks have started shaping their mindset and strategy towards an IT company’s approach, and to adapt to this new technological context. Nonetheless, high-tech companies, both incumbents and start-ups, have recently stepped in the payment industry and gained significant ground by offering their customers alternative payment methods with added value on the user experience and on additional services created on top of the payment service itself. There is a pressing need for innovation on the retail banks’ side in order to gain competitive advantage over these high-tech players and to survive the digital transformation.

This is where the practical contribution of our research comes in: we give retail banks an approach on how they could improve their service offering by creating Value-Added Services on top of payment, and seamlessly integrate these with the existing digital payment instruments. For this purpose, a technical system which allows the implementation of such services was designed within our research. Not only did we design a system which satisfies the business stakeholders, like merchants, regulatory bodies, or equipment manufacturers, but we also payed explicit attention to the social values that the solution supports or hinders. This approach is taken firstly to insure that the end-users will adopt the new technology, but also to increase the social responsibility of engineers and system designers. Technologies are intrinsically value-laden which means that besides supporting some values and hindering others, they also introduce new values in the society. It is our responsibility to insure that these values will be the ones with a positive effect and not a harmful one.

To reach this purpose we took a Value Sensitive Design approach, which is a research methodology that specifically accounts for human values before and during the design of a technical system. We combined this with the Design Science Research Methodology to offer a more sequential structure to our research, and with other concepts like Boundary Objects and Constructive Technology Assessment in order to overcome some of the methodological limitations of Value Sensitive Design. Taking this value-centric approach of designing technical systems, improving it on a methodological and conceptual level represents the scientific contribution of the current thesis.

The research effort is structured in several sections: the first chapter, Introduction presents the practical and scientific problem along with the research design. In the second chapter, Domain Background, the contemporary digital payment methodologies and digital Value Added Services are presented, along with their relevance and current implementations in the Netherlands. Further on, in the third chapter, Stakeholder Map, the stakeholders’ role and interests are identified, after which their values are extracted. Trade-off and prioritization mechanisms are offered for selecting only the most relevant values to be introduced in the design of the new technical system. Chapter 4 consists of a Technical Map where the alternatives for implementing the system are investigated and the alternative which best supports the priority values is chosen and further developed. Finally, Conclusion constitutes the last chapter where we present our main findings, contributions, limitations, future development directions and reflections on the research process.
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Chapter 1: Introduction
1.1 Towards a Digital Payment Landscape in the Netherlands

From the invention of the payment card and peaking with mobile NFC, technology has been heavily shaping and influencing our way of conducting payments safely, securely and efficiently. With the implementation of each new standard, a better shopping experience was delivered, for which new infrastructures, organizations, and business models had to be created. While these payment methods and standards are very fragmented from one geographical region to another, there are some countries which have reached a certain level of homogeneity in their payment market and have managed to implement relatively standardized payment infrastructures.

One of these countries is the Netherlands, which started in 2003 the migration from magnetic stripe cards towards EMV approved bank cards, also known as chip/smart cards (Maatschappelijk Overleg Betalingsverkeer, 2004). Currently all payment cards in the Netherlands are compliant with this EMV standard, which is developed by EMVco (an association between Europay, Visa and MasterCard) with the purpose of increasing securing in card payments. In 2012 the number of payments carried out with debit cards constituted 39% of the total number of payments (Hernandez & Kosse, 2012) and we can expect this number to be even higher now considering that the same source reports a 15% increase in debit card payments only between 2010 and 2012. In the same period the number of cash payments has dropped from 4.4 billion to 3.8 billion (Committee on Payments and Market Infrastructure, 2012).

We can thus notice a homogeneous payment landscape with comparable amounts of cash and debit card payments, but with a tendency of migration from cash to electronic payments, mostly debit card, otherwise known as PIN payments in the Dutch market.

Besides the PIN and cash payments which constitute the channel of offline payments, Dutch consumers also prefer more and more the online channel, mostly via iDEAL. (Expert Group Transaction, 2013) reports that the Dutch e-Commerce market is one of the most developed in the European Union, closely following the ~45 billion dollar market of France, the 3rd biggest in Europe after UK and Germany. The same study shows that online payments account for an increasing 10% of the total retail turnovers, while the offline retail is losing ground as years go by. All these are indicators that the payment landscape in the Netherlands is becoming increasingly digital (ING, 2015).

Even more, since 2013, Dutch banks have started issuing also contactless EMV compliant Maestro PayPass debit cards for their customers taking electronic payments to the next level (MasterCard, 2012). Subsequently, more and more retailers all over the Netherlands started introducing the EMV dual-interface - contact and contactless - payment terminals. At the moment of introduction, this was considered a movement that paved the way towards mobile NFC payments, since the dual-interface terminals can also be used for realizing payments with NFC enabled smartphones (MasterCard, 2012).

A recent survey by (ING, 2015) also shows the rising importance of mobile banking in the Netherlands, by stating that it is the “most developed” market for this service, closely followed by the US.

To conclude with, we define digital payments as the payments conducted via a channel different than cash. These include offline electronic payments like debit and credit cards or online and even mobile payments which are becoming increasingly important in the Netherlands because of its homogeneous payment infrastructure.
1.2 Practical Problem

To begin with, a central concept to the current research is introduced: following (Augsburg & Hedman, 2014) we define Value-Added Services for payments as the bundle of services that accompany the actual payment service and improve the shopping experience by generating extra value for the customer, on top of the payment process. Just to name a few, many retailers offer loyalty and couponing points, gift cards, bonus cards, vouchers, receipts etc.

While the main focus in the industry up until now was on improving and securing the payment transaction itself, not much attention was given to these additional services, which are still being delivered via traditional methods, e.g. paper and cardboard. Having to always remember to carry coupons and loyalty card, vouchers, gift and bonus cards in the physical wallet can be quite a hassle and diminishes the quality of the shopping experience. Also, consumers have to safely store receipts for warranty or product return purposes, not to mention that one might find it difficult to keep track of his expenses using the physical receipts, printed in different formats, from different retailers. Last but not least, the paper wasted yearly on receipts alone is quite impressive (Smartb2bmarcom, 2010), not to mention all the other Value Added Services. In a world concerned more and more with sustainability we cannot afford this kind of unnecessary use of paper. Considering all aspects above, the need to digitize these payment-complementary services is becoming more and more stringent.

Even though there have been some efforts to digitize these services on a global level (Apple Pay, Google Wallet, Samsung Pay, and others) none of the current implementations are being used on a wide scale in the Netherlands (Expert Group Transaction, 2013). This might have to do with the fact that local merchants need local solutions, tailored to their specific needs. While the universal character of the previous solutions might be appealing for a less homogeneous payment market, in the case of the Netherlands it did not provide enough incentive for users and merchants to adopt these Value Added Services systems. As it will be presented during a later chapter, a very small number of VAS solutions have been implemented locally in the Netherlands, but they lack standardization between shops and platforms, not to mention factors like scalability or the integration with the payment process itself.

Which brings us to the practical problem: in the current Dutch payment landscape there is no standardized, secure and scalable system for digital Value Added Services integrated with digital payments. While the problem firstly affects the users, the current research will focus on the banks’ perspective and the reason is the following: digital Value Added Services constitute a powerful incentive for users to switch from cash to digital solutions like mobile or online payments (Augsburg & Hedman, 2014). This aspect concerns banks, which are currently spending an increasing amount of resources for digitizing their services (i.e. internet/mobile banking, mobile payments and so on). In the end, these complementary services increase customer satisfaction and add value to the core payment, which is why banks are highly interested in offering a better integration of these services within the new digital payment landscape. This is as a response to the threat represented by the large players in the Silicon Valley, like Google, Apple, PayPal or other IT companies that have recently migrated their business into payment. Because these giants are very focused on the customer’s experience (Interview O.M. 2, 2015) and because they use the latest technology to offer the best user experience, in the long run they might take over the bank’s business by offering better payment services. To quote a bank executive during an EBA (Euro Banking Association) summit: “We as bankers spent a lot of years and billions of dollars building this banking ecosystem, this very reliable infrastructure, which for me is like a beautiful skyscraper. A state-of-the-art building. And then comes the year 2010 and there are a bunch of people, call them innovators or Silicon Valley high-tech players,
that start building a penthouse on top of OUR skyscraper. And in this penthouse there is a party going on. But we have not been invited.” (Interview O.M. 2, 2015). We thus define banks as the current problem owners. Whether we talk about the debit card transactions which totaled 79 billion euro at Dutch terminals in 2010 (Committee on Payments and Market Infrastructure, 2012) or the Dutch ecommerce which brought over 10 billion euros in revenues in 2013 (Webwinkel Weblog, 2014), or the mobile payment market which has a potential of each of these digital payment methods can be improved by digitizing the value-added services accompanying them. So as one might have guessed from the previous chapter, the magnitude of this problem cannot be estimated.

1.3 Scientific Relevance

While the industry specific problem is clear up to this point, one might argue about the scientific relevance of the current research. Every research effort should add to the academic body of knowledge, and this section analyzes the academic frame around the previously described practical problem. Two different sides of the academic problem were identified: firstly the lack of academic research on VAS integrated with digital payments, and secondly the lack of studies that take a human value centric approach to designing payment systems.

To begin with, there is indeed a great amount of papers related to the payment industry, but most of the studies are focused on the payment process itself not on the Value-Added Services defined earlier. After a thorough literature review some papers on Value-Added Services were indeed found, even though their scope is different than ours. Nonetheless they will be briefly described in the following paragraphs, because they constitute the academic pillars on which the current research was built.

The following data bases were used: Scopus, Science Direct, Web of Science, Google Scholar and TU Delft Repository. Keywords like: ‘electronic payment’, ‘online payment’, ‘card payment’, ‘mobile payment’, ‘NFC payment’, ‘digital payment’ were combined with terms like: ‘value added service’, ‘loyalty program’, ‘coupons’, ‘vouchers’, ‘customer loyalty’, ‘receipts’ to form the search queries. From the resulted list, the papers tackling strictly with payment were not selected, leaving up for analysis the ones that specifically treat the Value-Added Services. The scarcity of research material in the field made it impossible to further refine the search using criteria such as the number of citations or journal ranking. Consequently, all 12 resulting papers were analyzed. The following were selected as the most relevant.

The most cited article on the topic is written by (Augsburg & Hedman, 2014) and is entitled ‘Value Added Services and Adoption of Mobile Payments’. The study is the first empirical effort that strives to correlate VAS with the consumers’ intention of adopting mobile payments. Not surprisingly, the findings show that the users’ intention to adopt mobile payments is positively influenced by the existence of complementary VAS. Also the researchers underline the fact that payment providers in the world of mobile should bundle their core payment offering with VAS, while VAS providers should consider offering payment services besides the VAS. The study points out as a limitation the fact that it treats the 3 value added services (merely receipts, loyalty cards and coupons) without differentiating among them. For our research purpose, we believe this is not a limitation since we are interested in the overall VAS, not the effect of a specific one of them. While this study is not technical and does not tackle with the design of the desired VAS system, it is important to our research as a confirmation that creating such a system would be extremely beneficial for banks in the Netherlands, as it would increase the adoption of their mobile payment/banking solutions.
An interesting paper by (Borrego-Jaraba, Garrido, García, Ruiz, & Gómez-Nieto, 2013) creates a ubiquitous framework for the use of QR or NFC-based loyalty card, coupons and vouchers. The focus of WingBonus, as they called the system is the creation, distribution, customer redemption and merchant validation of VAS. The system tackles with VAS from the merchant-client perspective, merely how the retailers can use this system to push their offers and discounts to the customers that use the WingBonus app and website. It does not include the possibility of integrating digital receipts however and it does not offer seamless integration with the payment action itself. While it is certainly valuable, we believe that a system like WingBonus is not a substitute but rather a complement of the VAS system we want to design. This is because our research has a slightly different scope: we are not interested in designing a system that the merchants can use to create digital vouchers/coupons/loyalty but rather that takes the existing digital offers of the merchants, centralizes them and integrates them seamlessly into the entire payment process, along with digital receipts. From this paper we got inspired on the security level, for the mechanisms the authors use to ensure that the some VASs, namely the vouchers, are uniquely identified and cannot be multiplied.

The next reference paper for our study presents the MobiPag system (Rodrigues et al., 2014). As opposed to WingBonus, this system does offer integration of payment with loyalty, but only in the context of mobile NFC payments, and subsequently only in brick-and-mortar locations. It does not offer a solution for payment with cards and online shopping, or a modular architecture that could allow the integration of this feature at a later date. Nor does it handle digital receipts. Similarly, (Dominikus & Aigner, 2007) and (Alshehri, Briffa, Schneider, & Wesemeyer, 2013) tackle with security issues of mCoupons, the digital coupons for mobile payments, which means again that they are limited to mobile NFC. Our research will cover also what these three papers lacks in scope. Nonetheless, these studies contributed to our research by identifying the main security concerns regarding mCoupons.

(Ho, Apostu, Michahelles, & Ilic, 2013) present a study conducted with a mobile app for storing digital receipts in a real-world supermarket scenario. The paper provided important knowledge for our research on how digital receipt apps are perceived by users and how they could foster the adoption of mobile payments, but it lacked offering a technical solution. Even more, the app is not independent of the platform or payment method. Nor did it offer integration of other Value Added Services like loyalty cards, coupons, vouchers and so on.

To conclude with this first part, the literature review on existing VAS systems contributed in two ways to our research: firstly from (Augsburg & Hedman, 2014) and (Ho et al., 2013) we learned how important digital coupons, loyalty points and receipts are for encouraging the adoption of mobile payments, which is one of the bank’s core interests. Secondly, on a technical architecture level, from (Borrego-Jaraba et al., 2013) we got inspired for the security protocol of vouchers and from (Rodrigues et al., 2014), (Dominikus & Aigner, 2007) and (Alshehri et al., 2013) we got a sense of the security issues that NFC-based mCoupons might run into. Yet, none of the articles presented a solution of a system that is independent of the payment instrument and that is extensible to all the value added services. All articles were focused exclusively on mobile payments, and do not include cards or online payments. This makes the existing body of knowledge quite limited in terms of designing a VAS system that can be seamlessly integrated with any payment instrument. Having analyzed all these pieces of the puzzle, a first knowledge gap that our study strives to bridge was identified: there is no research offering a modular, scalable and extensible architecture of a Value-Added Services system, which is compatible with any type of payment instrument (card, online, mobile).

In order to move on to the second knowledge gap, we have to take a look at the type of data that such a system, or any system processing payment data for that matter, handles. Even though our purpose
is not to design a payment system, just integrating the VAS system into the payment process involves processing some customer sensitive data related to payment (account number, password and so on). Considering the nature of this data, we believe that there is a crucial need to account for human values (i.e. privacy, security, trust et cetera) while designing such a system. Another reason is because in order to offer customer loyalty programs, the shopping behavior must be monitored in some way and this might lead to undesired target marketing by 3rd parties, should the data not be properly encrypted within the system. So the system should not just be designed and then analyzed if and what human values it respects, but we should account for these values before and during the design process. Consequently they should steer technical decisions and influence the final architecture of the system. The Netherlands is even more concerned with this aspect, considering that the Dutch Government voted at the end of May 2015 a decision to investigate issues like the privacy of account holders in the case of Google Wallet and Android Pay (Tweede Kamer, 2015): “The Chamber, having heard the debate, noting that there are many new developments in the market for payment services, including Google Wallet and Apple Pay, want to investigate whether these new technologies present potential risks to the privacy of account holders; because the privacy of the account holders should not be subordinated to delivering commercial payment services”. This obviously increases even more the research relevance in the practical geographical context and current timeframe.

Consequently, a second literature review was conducted, but this time on artifact design approaches that take human values in consideration. The same databases as in the previous search were used. Keywords like: ‘Value Sensitive Design’, ‘human values, ‘privacy’, ‘trust’, ‘security’, ‘moral norms’, ‘ethical engineering’, ‘system design’, were combined to form the search queries. A multitude of papers were found on how to approach a human value oriented design process. The search was further filtered by combining the previous terms with other terms like: ‘design electronic payment’, ‘design online payment’, ‘design card payment’, ‘design mobile payment’, ‘design NFC payment’, ‘design digital payment’ to form new search queries. The decision of going for payment systems in general and not for VAS systems in this part of the literature review was because in the previous investigation focused on VAS, nothing related to the human value sensitive VAS design was found. From the resulted list, empirical research on what human values are important in consumer acceptance for different types of payments were ignored for now. The reason is because in this stage, the literature review’s focus was on how human values change and define the form of a system during its design, not after the product is released. Nonetheless, even after widening the scope of the review from VAS to payment systems in general, no materials were found.

Subsequently, a second knowledge gap that the current research strives to fill, was identified: in the existing academic research, there is no value sensitive approach on designing systems related to payment technologies.

A third search was conducted by combining the search terms ‘Value Sensitive Design’, ‘human values, ‘privacy’, ‘trust’, ‘security’, ‘moral norms’, ‘ethical engineering’, ‘system design’ with terms like ‘information systems’ in general. The purpose was to at least find a value sensitive approach to designing information systems in general even if they are not specific payment/VAS systems. The resulting papers were mostly from the Computer Science area, including Software Development, Human Machine Interfacing, and Mobile Technologies. An important conclusion is that the Value Sensitive Design research methodology offers a structured way of specifically accounting for human values before and during the design process of a technical artifact (Friedman, Kahn Jr., & Borning, 2006). VSD (Value Sensitive Design) is a central concept to our paper as it constitutes the backbone of our research methodology. For this reason it will be presented as a separate topic in later chapters, dedicated exclusively to describing methodology and human values.
1.4 Research Objective, Questions and Flow

Based on the knowledge gaps previously identified, the current research proposes to:

| Research Objective | **Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values.** |

Because the word *design* is quite broad in its sense, we shall elaborate on its meaning for this specific context. While our research offers an overall design, the main deliverable is the technical architecture, so this is the main focus of our research effort. The decisions for one technology or another will be motivated through the human values lens. It is highly important to understand the difference between our research objective and the existing solutions presented in the literature review from the scientific relevance. We do not want to limit ourselves to NFC technology, like the existing VAS system designs do. Also, we do not want to investigate what impact VAS will have on the adoption of certain payment instruments, like mobile payments. We are interested in offering the technical solution in terms of architecture for a scalable, flexible VAS system that can be seamlessly integrated with any type of payment instrument and that specifically accounts for human values.

To achieve the main research objective the following research question must be asked:

| Main Research Question | **How can payment Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach?** |

In order to answer this Main Research question, we divided it into 5 research questions which need to be treated sequentially in order to provide a comprehensive final answer to the main research question. Every research question builds on the answers and knowledge provided by the previous research questions.

<table>
<thead>
<tr>
<th>Research Question 1</th>
<th><strong>What is the problem that needs to be solved?</strong></th>
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<tbody>
<tr>
<td>Sub-question 1</td>
<td><strong>What is the underlying practical problem? What is the difference between the real state and the desired of things?</strong></td>
</tr>
<tr>
<td>Sub-question 2</td>
<td><strong>What is the scientific problem? What are the gaps in the academic body of knowledge</strong></td>
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A first Research Question that must be asked is about the underlying problem that needs to be solved. This is a two-folded questions, in terms of practical problem, or the difference between the real state of the world and the desired state, and the scientific problem, namely a knowledge gap in the academic body of knowledge. For the first sub-question *desk research* focused on news articles, press releases and statements and government publications was employed as a research mechanism. For the second sub-question a comprehensive scientific *literature review* was conducted. The steps,
outputs and answers of this research question were already presented earlier in Chapter 1: Introduction.

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<th>Research Question 2</th>
<th>What are the relevant payment and VAS technologies?</th>
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<tbody>
<tr>
<td>Sub-question 1</td>
<td>What are the digital payment means that the system might to be compatible with?</td>
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<tr>
<td>Sub-question 2</td>
<td>What are the value added services that the system might support?</td>
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</table>

This second Research Question comes as naturally: before designing a system complementary to payments, we obviously need to know what type of payments are in the Dutch market for later choosing which of them to integrate with the value-added services. Also, considering we are designing a system for Value Added Services we need to know what these services are exactly, in order to identify which of them should be supported by the system. A classification, definition and illustration for the Dutch context of both digital payments and digital value added services is offered in Chapter 2: Domain Background. As mentioned in the preface, the research was conducted as a collaboration between TU Delft and the company UL Transaction Security based in Leiden, Netherlands. So for answering this question, besides desk research, the researcher also used the knowledge acquired from attending several specialized training sessions offered by UL Transaction Security on topics such as Card Payments, Mobile Payments, mCommerce and Payment Service Directives.

<table>
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<th>Research Question 3</th>
<th>What is the stakeholder map?</th>
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<tr>
<td>Sub-question 1</td>
<td>Who are the direct and indirect stakeholders for the VAS System? What are the communities of practice?</td>
</tr>
<tr>
<td>Sub-question 2</td>
<td>What are their interests?</td>
</tr>
<tr>
<td>Sub-question 3</td>
<td>What are their values?</td>
</tr>
<tr>
<td>Sub-question 4</td>
<td>What prioritization mechanisms are there in place for the values?</td>
</tr>
<tr>
<td>Sub-question 5</td>
<td>How can these values be translated into design requirements?</td>
</tr>
</tbody>
</table>

Having identified the payment types and services type, we need to identify the stakeholders to make sure their interest and values are aligned. For the first sub-question, a literature review on the payment industry and ecosystem/ value networks provided us with an initial list of actors affected by the new artifact. Also, as described later in the Chapter 3: Stakeholder Map, a thorough desk research was conducted on the existing project within UL that are similar or even remotely connected to this initiative. After identifying the stakeholders, empirical methods like semi-structured interviews were conducted with the UL advisors in order to determine their interests and values. These were combined with the social values extracted from empirical research. A prioritization mechanism for these values
was also offered. Finally, a list of common values and interest considered important for the system was compiled and a mechanism for translating these values into concrete requirements was offered.

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<th>Research Question 4</th>
<th>What is the best technical implementation for the VAS system?</th>
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<tbody>
<tr>
<td>Sub-question 1</td>
<td>What are the technical alternatives for implementing the VAS system?</td>
</tr>
<tr>
<td>Sub-question 2</td>
<td>How does each technical alternative support/ hinder the values previously prioritized?</td>
</tr>
<tr>
<td>Sub-question 3</td>
<td>What is the detailed technical architecture and the usage scenarios for the chosen alternative?</td>
</tr>
</tbody>
</table>

For answering the first sub-question, desk research and specialized trainings along with knowledge sharing sessions within UL Transaction Security were used by the research to identify the technical scenarios that could serve as a solution. Funneling was used as a technique to select just 4 final alternatives. These technical alternatives were mapped on the previously identified values and interests for checking to what extent each of the alternative supports or hinders these values. Finally the chosen technical paths was presented to UL advisors during a scenario workshop. The UL TS consultants were acting as stakeholder representatives during this scenario workshop. Chapter 4: Technical Investigations handles the research question and sub-questions related to choosing the best technical design.

Figure 1 below is a diagram illustrating the logical flow as it is up to the current point, starting from the main research question to the research questions and sub-questions resulting in the main research objective – update this
Main Research Question

How can Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach?

RQ1 - Chapter 1
What is the problem to be solved?
- SQ1: practical problem
- SQ2: scientific problem

RQ2 – Chapter 2
What are the relevant payment and VAS technologies?
- SQ1: digital payment instruments
- SQ2: value added services

RQ3 – Chapter 3
What is the stakeholder map?
- SQ1: direct & indirect stakeholders
- SQ2: stakeholders’ interests
- SQ3: stakeholders’ values
- SQ4: prioritization
- SQ5: design requirements

RQ4 – Chapter 4
What is the best technical implementation for the VAS system?
- SQ1: technical alternatives
- SQ2: value support
- SQ3: detailed design

Research Objective

Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values

Figure 1: Research Flow Diagram

1.5 Research Scope

Now that we have defined what the research is about, and what the objectives, questions and methods to answer them are, it is important to clearly state what the research effort is not about. This section presents the boundary of the current research.

The thesis is not about designing a payment system. We are not interested in securing, modifying or shaping in any way the digital payment technologies that consumers or bank use. This study is also not about the user acceptance criteria of payments, or acceptance criteria of VAS, or on how VAS influence the adoption of certain type of payment methodologies. It is also not the core of our research to provide strategies for deploying or commercializing the system. Nor is the direction of our research a policy-oriented one, or to align the parties to collaborate, even though while designing the
system the actors’ interactions were obviously considered as some of the input data. Finally, the focus of the current thesis is on the Business-to-Consumer (B2C) side of the retail sector, basically end user – merchant type of transactions, not on Business-to-Business (B2B), Consumer-to-Consumer (C2C) or transaction between any other parties.

1.6 Research Design

This section shortly introduces the scientific methodologies and paradigms used to conduct the research. They will be detailed more during later chapters, in which each of the methodologies was predominantly used. A first and central concept to the current research effort is Value Sensitive Design (VSD). This is a design method which emerged more than 20 years ago in the area of Information Systems, with the purpose of offering theoretical and methodological constructs to account for human values during the design process of a technological artifact (Friedman et al., 2006). We define a value as anything that a person or group of persons considers important to their lives (Manders-Huits, 2011). So VSD accounts for human values and moral norms, but also for other values such as user preferences (for example in terms of graphical interface), standardization, usability, and so on. Not only does VSD focus on these values explicitly during the design process, but proposes to map them to the corresponding actors that interact or are affected by the technological artifact in question. For this reason, identifying the direct and indirect stakeholders also plays a central role in VSD. Identifying their values, the trade-off mechanisms to prioritize them and accurately mapping them to each stakeholder constitutes one of VSD’s challenges (Manders-Huits, 2011). Are presented in the previous subchapter, these paradigms that constitute the pillars of VSD were also the guidelines that we used to design our research effort.

But several communities of stakeholders from different disciplines can interpret the same terms and concepts in a totally different way (Fritsch, 2007). To exemplify, the term ‘data protection’ in the mobile wallet can have a totally different meaning between different groups like: mobile app developers, bank executives, mobile operators, merchants or users. Each group might be interested in securing more different parts of the data. This is why common terminology between these groups needs to be defined regarding the central concepts of the research. To this purpose we turn to Boundary Objects as a tool for stakeholder requirement elicitation during the design process. Boundary Objects are constructs that are flexible enough to be interpreted differently in each community of practice, yet robust enough to maintain integrity and identity (Star & Griesemer, 1989). They are constructed using the common terminology and interpretation of the terms across the different communities of practice (Fritsch, 2007). Combining Boundary Objects with VSD is something that hasn’t been attempted before in the existing academic literature and this approach could compensate for one of the VSD’s shortcomings, namely that some values may be interpreted differently and generate different norms and actions among different groups of stakeholders (Manders-Huits, 2011). We elicited the values and interests that were prioritized as the most important, and defined them according to common terminology among the communities of practice.

Coming back to the Value Sensitive Design, an important characteristic of this methodology is its Interactional Theory perspective. This means that the relationship of influence between technology and people is bilateral, merely that social systems influence the development of technology, but also technical systems shape certain social aspects. This raises the importance of constructing a technical artifact which, through its architecture, not only satisfies the current social needs and human values,
but also allows creating new interaction patterns and social applications on top of it (Friedman et al., 2006).

Next, a key aspect of VSD is its **Tripartite Nature**: it relies on conceptual, empirical and technical investigations. The conceptual investigation has the purpose of creating an informed analysis of the topics that are being investigated; this includes the stakeholders, their values and prioritizing/trade-off mechanisms. After building this conceptual framework, different empirical research methods (i.e. observations, interviews, surveys, focus groups, experiments) are used to gain an understanding of the broader social framework and human response to the technological artifact that’s being designed. Finally, the technical side of VSD tackles with investigating the technological mechanisms and how they support or hinder the stakeholders’ values. The technical research involves, besides investigating technological solutions for the new artifact, also a retrospective analysis of the existing technologies. During this retrospective analysis, the existing path dependencies within the current technological landscape were analyzed. Two important characteristics of the tripartite methodology, are its **integrative and iterative nature**: not only does it combine the conceptual, empirical and technical investigations, but these are conducted in cycles, so that the findings of one cycle can serve as an input for the following cycle (Friedman et al., 2006). This creates an artifact which is improved from one iterative cycle to the next, and allows for greater flexibility in design.

This brings us to another important theoretical concept in our research, merely the **Constructive Technology Assessment (CTA)** methodology, which originates from the **quasi-evolutionary theory**. CTA suggests that because of the strong socio-technical nature of technical artifacts (which we already reminded while presenting the Interactional Theory), stakeholders should be involved during the design process itself in order to account more for their interests and broaden the design perspective. The purpose of CTA is to bring ‘outsiders’ into the development process and have them interact with the developers of the system (Pesch, 2014). While CTA does not explicitly look at values, we believe that it can be used as a useful tool to realize incremental improvements of the system, by opening up the selection environment to external stakeholders and actively involving them in the design. **Scenario workshops** were used as a particular participatory technique for implementing CTA in our research. The purpose of such workshops is to assess future possible states of a technical artifact in order to clarify some fundamental uncertainties regarding the respective technology. These future states are presented under the form of scenarios which are distinct via the different initial conditions or a different dynamic (Pesch, 2015). The purpose of the scenarios is not to cover every possible use-case of the technology, but to improve the interaction among stakeholders by offering them a story-line on which to bring their input. As (Pesch, 2015) pointed out, these scenarios workshops also have the advantage that they do not over-emphatize a specific future form of the technology, but it is a form of forecasting that can give rise to different values in relation to the future usage of that technology.

The nature of the study is exploratory, since little or no research has been previously done on Value Added Services for payments. The Value Sensitive Design methodology was combined with the Design Science Cycle in order to offer a more structured research design that considers human values ex-ante, before the technology is actually created and deployed to the market. So the next relevant research paradigm is the **Design Science Research Methodology (DSRM)**. Even though the current research paper does not follow a Design Science Research Methodology per se, but a VSD one, the design cycle steps suggested in this methodology will be used to add more structure to our research. According to (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2008) DSRM “creates and evaluates IT artifacts intended to solve identified organizational problems.” The design process is divided in multiple stages: Problem Identification, Definition of Solution Objectives, Design & Development, Demonstration, Evaluation and Communication of the results. While DSRM offers indeed a structured
approach to the design process, it does not offer a methodology per se. Which is why we combine the structured process of DSRM with the strengths of VSD (socio-technical focus, iterative and integrative nature), CTA and Boundary Objects.

Figure 2 below enriches the research flow diagram presented in the earlier subchapter by mapping the research questions on the methodologies specifically suggested by VSD. The diagram also includes the techniques used for answering the research questions, which were also presented in the previous subchapter while listing the research questions. We used the design science research methodology cycle to offer VSD a backbone for more structure.

![DSRM Cycle Diagram](image)

**Figure 2: Research Design Diagram**
Having concluded this chapter, we have established our research design and methods but we also answered RQ1: *What is the problem that needs to be solved* with its associated sub-questions.

<table>
<thead>
<tr>
<th>Research Question 1</th>
<th>What is the problem that needs to be solved?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Sub-question 1</td>
<td><em>What is the underlying practical problem? What is the difference between the real state and the desired of things?</em></td>
</tr>
<tr>
<td>✓ Sub-question 2</td>
<td><em>What is the scientific problem? What are the gaps in the academic body of knowledge</em></td>
</tr>
</tbody>
</table>

The data from this chapter was further used to develop Chapter 2, which creates an overview of the relevant digital payment methods and VAS in the Dutch market. Without having identified the practical and scientific problem, the need for this payment methods & VAS overview would not have been defined, so answering this first research question directly laid the foundation for research question number 2, namely ‘*Who are the stakeholders?’* The progress of our research effort so far is shown in Figure 3 below:

**Main Research Question**

*How can Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach?*

**Research Objective**

*Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values*
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Chapter 2: Domain Background
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2.1 Relevance

The purpose of the current chapter is to identify the technologies and services that are present in current Dutch payment landscape, and that might be of interest for the new VAS system. Without having an initial idea on what kind of payment technologies might be integrated with the system, and what kind of value added service should it support, the research cannot continue into identifying the stakeholders, and ultimately into creating the technical architecture.

The first part of the chapter creates a classification of all the digital payment types available at the current moment in the Netherlands. This does not mean that all these payment methods will be supported in the new VAS system. Further empirical, conceptual and technical research will define which of these payment types will be covered.

The second part of the chapter classifies the available value added services in the Netherlands. Again, not all these VAS will be supported by the new system, but this is to be determined in the later chapters.

The output of this chapter constituted a starting point for identifying the stakeholders in the Dutch payment landscape. Also, this analysis helped the researcher identify which projects from the UL TS repository might be relevant for designing the new VAS system. Those projects were selected based on this taxonomy of the digital payment means and value added services, and the knowledge extracted from them served as the foundation for the following two chapters.

The research question that this chapter proposes to answer is RQ2: What are the relevant payment and VAS technologies? With the associated sub-questions SQ1: What are the digital payment means that the system might to be compatible with? and SQ2: What are the value added services that the system might support?
2.2 Digital Payments

Even though the current thesis focuses on the Value Added Services accompanying payments, not on the payment method itself, we find that it is important that our readers also understand how digital payments can be classified. The reason behind this is because in the end trade-offs might be necessary to establish which forms of payment should or should not be integrated with the VAS system. By coming back to the previous chapter, we remind the fact that cash payment are out of our research’s scope. This first subchapter presents a short overview of the different digital payment types and their presence in the Dutch market. We do not strive to make an exhaustive classification or present the complete historical evolution of the digital payment methods in the Dutch context. We do however want to introduce the main categories of digital payments and the products by which they are represented in the Netherlands. The payment dimensions identified by (Ondrus, 2003) were used as a starting point for the classification. Table 1 below depicts his classification.

| By means | Cash, Paper (Cheques, Bankers draft), Card (Credit, Debit, Smart), Electronic (e-commerce, virtual money, e-wallet, stored value account), Tokens/money surrogates |
| By size | Micro-payments (generally below 10 Euros), Macro-payments |
| By place of Purchase | Real-world or F2F, Remote (Internet, Mail and telephone orders) |
| By Seller/Buyer Origin | B2B (rare for m-payment), B2C, P2P |
| By Type of Purchase | Physical goods, Digital/electronic goods, Rights (rich media) |
| By Clearing and Settlement Method | Bilateral, Multilateral (joint clearing house), Using intermediaries |
| By Type of Transaction | Pay Per View (PPV), Pay Per Unit (PPU) |
| By Time of Payment | Pay now (debit), Pay later (credit), Pre-pay (against stored value) |
| By Geography | Domestic, Cross-border, Single currency, Multiple currency |
| By Location of Payer’s Account Details | Network/server-based, Device (client-based), Chip (client-based) |

Table 1: The different payment dimensions (Ondrus, 2003)

From these dimensions, ‘geography’ was excluded because of its irrelevance to our research: we are only interested in payments in the Netherlands, not across borders. Also the ‘clearing and settlement’ dimension was excluded, since we are not interested in how the clearing and settlement is done by institutions in the backend of the payment model. ‘By type of purchase’ is another classification that is irrelevant to us, since the VAS system should perform the same regardless of the customer’s choice of goods or services. Finally, the dimension ‘time of payment’ (pay now – debit, pay later - credit) was treated across other categories such as means of technology or location of purchase, and not a stand-alone category in itself. Also, we are not interested if the user pays per view or per item, and if his account is stored locally on a card/device or in a network/database. Consequently we can distinguish between the following classification criteria for payments: the ‘location of the purchase’, the ‘amount of money paid’, the ‘means of technology’ to conduct the payment and by the ‘type of participants’ which is named ‘by seller/buyer origin’ in the table.
2.2.1 Classification by Location of Purchase

The location of purchase is the first category by which payments could be classified: the payments conducted in the physical store called real world or face-to-face (F2F) payments and the remote payments (Ondrus, 2003).

The first category of payments are also known as payments done in brick-and-mortar shops (Pousttchi, 2008), and here we include any type of digital payment that is conducted at the merchant’s physical point-of-sale (POS). These transactions are also known as Card-Present (CP) transactions since the customer’s card is present at the POS, either in a physical or in a virtualized way. In the Netherlands almost half of the brick-and-mortar payments are conducted with debit cards, the other half being conducted with cash. More details on the type or cards will be offered in a following section.

In the digital world, the second category, remote payments, is represented by online payments. These transactions are also called Card-not-Present (CnP) transactions, since the customer’s card or a card reader is not necessary to conduct a payment (Vacheron, 2012). Another differentiation can be made between the two categories in terms of the ‘time of payment’ dimension (Ondrus, 2003): while for the first category the customer pays at the moment of acquisition, in the second type of payments the consumer usually pays before he receives the goods. Online payments can be realized from the user’s bank account, or from a different prepaid account. More details on the type of online payments and their presence in the Netherlands will be given in a following subchapter that classifies payments by the technology used to realize them.

2.2.2 Classification by Amount

Based on the amount of money the customer has to pay, a distinction can be made between micro-payments and macro-payments. The former are usually amounts below 10 Euros and are usually conducted via debit card or cash. The latter are anything over this 10 Euro threshold, as (Ondrus, 2003) classifies them. The difference between the two categories is also reflected in the security mechanisms that are involved in the payment process. For optimizing the customer experience and transaction flow and considering the small risk, micro-payments are not that highly secured as macro-payments. Additional Customers Verification Methods (CVM) are introduced for macro-payments.

In the Dutch payment market, since the introduction of contactless debit cards, we will consider the micro-payment limit as being 25 Euros because users do not have to input their PIN in order to make contactless payments below this amount. Alternative security mechanisms are of course implemented, like customers having to eventually input their PIN number every time the cumulative value of consecutive contactless payments reaches 50 Euros. This is a security mechanism in order to prevent fraud if the card should be stolen, so that small payments without PIN cannot be conducted endlessly. (Breekel, 2014)

2.2.3 Classification by Means of Technology

By the technology involved in the transaction, we can differentiate between 3 types of digital payments: card, mobile and online payments. These categories sometimes overlap and their boundaries are not clearly defined. For example, when a consumer is conducting an online payment with his bank card number and card security code (i.e. CVC, CVV) he is practically using his card details
to conduct a payment, but via an online, not a physical medium. By the same principle, a consumer conducting a proximity NFC mobile payment is practically using the Secure Element (SE) in the smartphone to hold the data that his card usually holds. Finally, consumers can conduct a mobile payment with a smartphone, but using a prepaid account (like PayPal) and an Internet connection which makes it an online/web payment but conducted via a mobile phone. In the following paragraphs we will present each type of payment and discuss the intersection between these categories.

**Card payments**

The first category consists of card payments which can be further divided into debit, credit and prepaid cards, based on the user’s account type. In the Netherlands, since 2003 all payment cards were migrated from magnetic stripe to smart cards. This means that nowadays all the debit and credit cards use the same technology, which is based on a chip (integrated circuit) which retains the user’s sensitive data like bank account number, personal identification number and so on. The migration was initiated because it has been proven these smart cards are more secure and reliable against fraud than the previous magnetic stripe ones. All payment cards in the Netherlands are compliant with the EMV standards, which date from 1999 as an EMVco trademark, and deals with the chip-cards and the associated terminals specifications and evaluation. The standard is being pushed on a global level as the next card payment technology by EMVco, which is the joint venture responsible for ensuring the security, acceptance and interoperability of payment transactions. (EMVCo LLC, 2014)

The vast majority of card payments in the Netherlands consists of debit card payments, which are marketed by Currence under the consumer brand PIN (‘pinnen’), a name inspired from the Personal Identification Number (PIN) used as a Card Verification Method (CVM) for debit cards. Currence is an association of the banks in Netherlands that develops consumer payment products for the purpose of offering interoperable, secure and transparent financial services (Committee on Payments and Market Infrastructure, 2012). In 2010, out of the total 30.2 million payment cards registered in Netherlands, 24.4 constituted debit cards and the other 6 million credit cards. The number of debit card transactions has been increasing ever since, from 2.2 billion totaling 81 million Euros in 2010 to 2.5 billion totaling 84 million Euros in 2012. On the other hand, only 0.04 billion credit card transactions were registered at the time, totaling 4.5 million Euros (Hernandez & Kosse, 2012). The conclusion is that although debit cards are dominant, credit cards are used very little, but usually for larger amount payments.

Finally there are the prepaid cards, but this term needs more elaboration. An initial distinction needs to be made between closed-loop and open-loop prepaid cards. The former notion refers to cards that are released usually by a retailer or an association of retailers and can be used only in their specific shops. The latter notion on the other hand refers to cards released by a payment institution and that can be used regardless of the retailer or buying purpose (Crowe, Pandy, Tavilla, & Jenkins, 2013). The first category also includes merchant-specific gift cards. We include these closed-loop prepaid cards under the VAS category and we do not treat them as a payment method in this stage of our analysis. The reason for this is because we do not look at a merchant pre-paid gift card as a payment means by itself, but more of an additional service that provides a discount from the original price which is still paid via one of the digital payment methods presented in this section. For these merchant-specific pre-paid cards we will later use the notion of gift cards to identify them as one of the VAS types. Another reason for classifying these gift cards as VAS would be the lack of universality of these cards, which makes us reluctant into classifying them as payment products.
So, by the notion of prepaid cards we will refer from this point on to the ‘open-loop’ prepaid cards, merely cards that are compatible and suitable for any type of payment and merchant, not only in a limited number of stores. These cards are poorly represented in the Netherlands. (DataMonitor, 2012) shows in a study that most Dutch consumers find them unnecessary and do not upload money regularly on them. The most popular prepaid card in the Netherlands used to be Chipknip, which acted as an electronic purse (e-purse) bundled with the debit card and was used for small payments (Committee on Payments and Market Infrastructure, 2012). But since the 1st of January 2015 Chipknip was discontinued and the prepaid cards have lost presence in the Netherlands (Currence, 2015a). Since then, merchants have successfully conducted campaigns like ‘Pinnen, ja graag!’ to encourage consumers to use more debit cards and ‘Klein bedrag? Pinnen mag!’ to encourage consumers to do so even for the small amounts that used to be paid with the Chipknip (Expert Group Transaction, 2013). Other prepaid cards in the Netherlands include solutions like the 3V Visa which is basically like a visa debit card but with a balance that is prepaid in advance (Visa, 2015) or the type of solution offered by MasterCard (MasterCard, 2015). On a national level though, these solutions do not have a significant number of adopters (Expert Group Transaction, 2013). At this stage of the research it is still not clear yet what type of card payments should the VAS system support.

### Online payments

The next type of payments when classifying by technology, are online payments. By online payments we refer to payments realized via an Internet connection regardless of the device from which the payment is conducted. It can range anywhere from a PC/laptop to a tablet or smartphone as long as it has an active Internet connection. A study by (Expert Group Transaction, 2013) reveals that 58% of the Dutch customers that shop online use iDEAL, making it the most popular online payment method in the Netherlands. Pay-later methods like Acceptgiro (online version) follow with 14%. Finally, and PayPal is present among only 5% of the customers. The rest use credit card or online bank credit transfer for their online shopping. We can only presume that the popularity of iDEAL is the reason why online payment methods like MasterCard’s Masterpass or Visa’s Checkout are poorly represented in the Dutch payment context. The online payments could be roughly classified in 2 sub-categories: online payments made from the current bank account (credit card, iDEAL) or from a pre-paid account like PayPal. These sub-types are not so much substitutable but more complementary. Consumers realize debit payment from their current payment account using iDEAL when shopping on local Dutch websites, since most of them support this payment method. But when shopping on international websites (like Amazon, eBay and so on) that do not support iDEAL, consumers realize online credit card payments or pay from a pre-paid account like PayPal (Expert Group Transaction, 2013). We can make a parallel between debit card payments and online payments conducted from the bank account on the one hand, and between pre-paid card payments and online payments realized from a pre-paid account on the other. As for the banks, the following financial institutions offer their customers the possibility to pay via iDEAL: ABN AMRO Bank, ASN Bank, ING Bank, Knab, Rabobank Regio Bank, SNS Bank, Triodos Bank and Van Lanschot Bankiers (Currence, 2015b). We underline again the blurred line between the card and online payments: when using credit cards online or even when paying with iDEAL using a debit card, consumers actually make use of their card details and current bank account. This technically makes the online payments conducted from the user’s current account a card payment, but in the virtual world not the physical one.
Mobile payments

Finally, a technology that is becoming more and more visible all over the world is mobile payments. Mobile payments is defined by (Ghezzi, Renga, Balocco, & Pescetto, 2010) as “a process in which at least one phase of the transaction is conducted using a mobile device (such as mobile phone, smartphone, PDA, or any wireless enabled device) capable of securely processing a financial transaction over a mobile network, or via various wireless technologies (Bluetooth, RFID,NFC, etc.)”. Four types of mobile payments can be identified: payments via SMS, cloud-based payments, proximity NFC payments, and QR/barcode payments (Hayashi & Bradford, 2014).

Firstly, Short Messaging Service (SMS) based mobile payments refer to micro-payments realized by sending a text message to the service provider in order to pay for goods or services. The billing is realized on the mobile phone account and text message codes are being sent to the consumer as a response to their payment. These can be shown at the merchant’s POS by consumers in order to pick up their products (SmartCard Alliance, 2011). This type of payment is wide-spread in developing countries where mobile network operators took advantage of the poor banking infrastructure and stepped in by attaining a banking license in order to offer wide-scale payment services. A well-known example of this situation is the M-PESA payment system developed in Kenya by Safaricom and Vodafone (Gaur & Ondrus, 2012). In the Netherlands SMS payments were conducted with the Rabo SMS Betalen service offered by the retail bank Rabobank, within their Minitix mobile wallet app. But the Rabo SMS payment service was discontinued in 2013, leaving this type of mobile payments poorly represented in Netherlands. It is still visible for micro-donations or for some popular TV shows in the Netherlands, but we will not include this in our research since it is not that dominant. For this reasons, out of all the mobile payments types, SMS payments will not be the focus of our research.

Secondly, (Hayashi & Bradford, 2014) defined cloud-based payments as the type of payments which have been treaded in the previous section as prepaid online payments, conducted from a mobile device. Basically the user pre-loads an account in the cloud from which he realizes online payments by using his smartphone or tablet. The PayPal App is an example of this type of payment. As this type of payment is a subcategory of the ones treated earlier, we will not further analyze it here. It is worth mentioning that the findings in the (Expert Group Transaction, 2013) survey show almost no difference in preferences between online mobile payments and online payments conducted from the PC/laptop for the Dutch market. We will further refer to what (Hayashi & Bradford, 2014) call cloud-based payments as online mobile payments, because the notion of cloud payments started changing its meaning since the release of the Android 4.4 operating system. The new meaning will be explained in a later paragraph during this section.

Thirdly, we can identify proximity mobile payments, which can be conducted via NFC or Bluetooth Low Energy (BLE). A user which has an NFC enabled phone (or an NFC sticker/tag or NFC micro SD), together with a payment app and with a debit/credit card issued by his financial institution, can simply wave or tap his phone near the merchant’s contactless-enabled POS in order to make a proximity payment. The previously mentioned Minitix mobile wallet from Rabobank started paving the way for NFC payments in the Netherlands, because besides its SMS payment service it also offered NFC payment capabilities. Another initiative for the development of mobile payments in Netherlands was the mobile NFC trial conducted in Leiden, in September 2013 where 1000 consumers with active accounts at ABN Amro, ING or Rabobank and 180 retailers were involved. This mobile payment experiment was an initiative from the remaining partners of “The Six-Pack” joint venture (which was a joint venture between ABN Amro, ING, Rabobank and KPN, Vodafone and T-Mobile for releasing mobile payments), after its dissolution in 2011 (Appeldoorn, 2014). The trial was a success in terms of both consumer and merchant uptake, with an estimated total payment of 20000 Euros, and an average of 2000 NFC
transactions per week, for the whole 3 months. Four out of five consumers even made more than the 25 compulsory transactions required by the trial organizers (Boden, 2014). UL Transaction security was also involved in this project. The successful trial made Rabobank focus on their new RaboWallet app, which was introduced at the beginning of 2015. As a result, their Minitix prepaid mobile wallet will be discontinued from December 2015. As opposed to the Minitix solution, RaboWallet is connected to the user’s bank account from which the payment is deducted directly, not to a prepaid account. The downside of their current solution is that it works only with Samsung Galaxy 4 and Note 3, which have an embedded Secure Element (Giesecke & Devrient, 2015). As its name suggests, the purpose of the Secure Element is to securely store the user’s sensitive data necessary in order to conduct a transaction. Basically, the secure element in NFC payments plays the role of the chip in the EMV smartcards. Vodafone also offers an NFC solution which is more universal: the consumer’s sensitive data is held on the SIM card, which acts as the secure element. This means that the mobile wallet can be used with any NFC enabled phone, not just the ones that have an embedded SE. The downside of their current implementation is that the user has to load a prepaid account/card and cannot connect the app to their existing bank account. Yet another illustration of the mixture between online mobile payments and NFC proximity payments. Other parties are currently making efforts to virtualize the Secure Element in the cloud so that a physical chip is not needed anymore. The technology is called Host Card Emulation (HCE) and it was developed by Google for their Android Operating System, from version 4.4 onwards. The downside of this approach is that it only works on Android phones that have the 4.4 or higher version of Operating System (Breekel, 2014). These type of mobile payments are also referred to as cloud NFC payments, because of the virtualization of the SE in the cloud.

Finally, we have the QR/barcode mobile payments. QR codes and/or barcodes represent information that can be read at by a scanner or another mobile phone at a merchant’s POS. Then the money is deducted from the user’s account. An example of a very successful payment app using this technology is the Starbucks App where the user presents his mobile phone with the app opened, and the cashier scans the barcode displayed by on the app screen. The money is deducted from the customer’s Starbucks payment account. This approach is taken also by the consortium called Merchant Customer Exchange (MXC) consisting of US giant retailers like Walmart, Best Buy, Target and many others. The purpose of developing their own payment system is to bypass the banks and their existing infrastructure, thus saving up on the card transaction fees that the merchants have to pay to the financial institutions. Even though users pay with their mobile phone at the merchant’s POS, the amount is being deducted from the user’s MCX prepaid account via the Internet, which technically makes it a remote/online payment using a mobile devices (Hayashi & Bradford, 2014). Yet another illustration of the blurred lines between the different technologies involved in payments. A more related European example is the initiative the retailer Auchan took in France in 2012, which proposed the same solution as MCX did in the US (S. Clark, 2012). In the Netherlands, even though the Minitix wallet, Vodafone wallet and PayPal wallet do offer the mobile solution based on a pre-paid account, their reading or input of any payment is not realized via QR codes or barcodes, so we will further on ignore these type of mobile payments as being unrepresented in Netherlands (Expert Group Transaction, 2013). Some of the QR/barcode technologies used by these apps will be used as an inspiration and a partial implementation choice for our VAS system.

To conclude with, the adoption of all these means of payment in the Dutch context seem quite stable in time, so no drastic changes are anticipated in the near future. One exception might be NFC mobile payments which might actually take off more in the near future because more players like major banks are releasing their mobile wallets soon.
2.2.4 Classification by Type of Participants

(Turban, King, Lee, Liang, & Turban, 2015) made a very comprehensive classification of electronic commerce transactions based on the participants involved. Since the categories’ name are very self-explanatory we will further present their findings and the different type of transactions: Business-to-Business (B2B), Business-to-Consumers (B2C), Consumer-to-Business (C2B), Consumer-to-Consumer (C2C), Government-to-government (G2G), Government-to-Business (G2B), Business-to-Government (B2G), Government-to-Employees (G2E) and finally Business-to-Employees (B2E). Figure 4 illustrates the relationships between the different types of identified transactions.

![Figure 4: Categories of transactions in e-commerce (Turban et al., 2015)](image)

We underline the fact that our research focuses on the upper left corner of the previous figure. We are interested in the value added services offered by businesses to consumers, so the red square in the figure, namely on the Business-to-Consumer (B2C) exchanges, merely the exchange of goods or services from businesses to consumers (Turban et al., 2015). These type of transactions are the ones that we want to design our VAS system for. For this reason the type of payments we are interested in are the ones in the green square, namely Consumer-to-Business (C2B) payments exclusively. We are not interested in creating Value Added Services to accompany fund transfers between consumers, between businesses or any other combination of parties from the scheme, thus we are not interested in those type of payments which use different mechanisms. This scope narrowing of our research is highly important because it influences the entire design of the research, from the stakeholders that are being considered and interviewed, to the technologies that are involved and analyzed.

All these payment types were carefully considered later on during our research, the implications for integrating VAS with each of them were analyzed in the broader value-driven and socio-technical analysis and the needed trade-offs were made by the end of our research effort. Taking a look back at the research design we underline the fact that this first section of the chapter has partly answered Research Question 2, more specifically Sub-Question 1:
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<td>What are the digital payment means that the system might be compatible with?</td>
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To conclude with, we have identified four types of classifications criteria relevant to the Dutch context. A review of the payment types present in each of the categories is presented in the Figure 5 below.
By means of technology

- Brick-and-mortar payments
  - Remote payments

By the type of participants

- Micro – payments (<25 Euros)
  - Micro – payments (<25 Euros)

By location of purchase

- Card payments
  - Debit card
  - Credit card
  - Pre-paid card

- Online payments
  - Debit account
  - Credit account
  - Pre-paid account

- Mobile payments
  - SMS
  - NFC Proximity
  - Remote/ online
  - QR/ barcode
  - UICC Secure Element
  - Embedded Secure Element
  - HCE

By amount

- B2C / C2B
- B2B
- B2E
- G2E
- B2G / G2B
- G2G
- G2C
- C2C

Figure 5: Digital Payments Classification
2.3 Value Added Services

The following section will define and present the type of Value Added Services that can accompany payments, while identifying some of their digital implementations in the Dutch payment context. As was the case for the previous section, the purpose is not to provide an exhaustive analysis but to underline the main Value Added Services and create a basis for choosing which ones to implement in the VAS system. Building on (Augsburg & Hedman, 2014) we already defined Value Added Services as the bundle of extra services that create extra value for the customer during the payment process. Just to underline the boundaries of our research again, an example of service that could improve the shopping experience would be Customer Relationship Management, merely customers giving feedback or rating products and services, integration with social media and so on. The services that we are focusing on consist of the ones that are most relevant to the actual payment process, not the entire shopping experience. The reason can be remedied by going back to the research objective: we design a system for banks, and while the payment process is part of their core business, rating & reviewing products or other retail specific VAS is not part of their core business. Another relevant aspect is that some of the identified value-added services have different redemption times from the moment when the consumer actually uses the VAS. This is a relevant information as it influences some of the implementation decision for the VAS system.

As was the case for payment methods, Value Added Services can also be classified using different criteria. The most important one and the only relevant one for our research is by the party benefiting from them: the consumer or the merchant.

2.3.1 Value Added Services for Consumers

Based on the literature review detailed in the Scientific Relevance sub-chapter, we identified the following types of extra services that can accompany digital payments, on a consumer side: receipts, gift cards, loyalty schemes, bonus/ membership cards, discount coupons/vouchers, and online check-in.

Receipts are the first and one of the most important Value-Added Services for payments. Besides giving the consumer the ability to track his expenses, receipts are also useful when returning a product for warranty purposes. So being able to store receipts safely and browse through them is important to consumers. (Ho et al., 2013) even showed that digital receipts could foster the adoption of mobile payments, since users would find it useful to be able to collect or display their receipts with the mobile phone. The global mobile payment solutions (like Apple Pay, Samsung Pay, and Android Pay) do not offer this feature because virtualizing the receipt is dependent on the merchant’s specific electronic cash register and POS, in case this receipt needs to be sent via the terminal to the mobile device. As for the Netherlands, there has been little to no effort into digitizing receipts: in the world of B2B transactions, TransFollow is the first platform of its kind in the Netherlands to offer the possibility to ‘submit, exchange, track and sign a consignment note digitally’ (TransFollow, 2014). This includes receiving a digital receipt at the end of the transaction which can be stored securely in the user’s account. The limitation with this platform is that it addresses only companies, not individual consumers. Nonetheless, it is an indicator that receipt digitization is indeed a useful trend to be implemented in the future. The only physical retail store in the Netherlands that actually offers digital receipts to their customers is the Dutch department store De Bijenkorf. The chain has been standing out previously because of their efforts to innovate and digitize retail shopping. Among other value-
added services, their mobile app also offers the customers the possibility to get their receipts digitally (De Bijke, 2014). With the current research we want to offer a solution that is applicable on a wider national scale, so that digital receipts can be used regardless of the merchant. Other places where digital receipts are present in the Netherlands, are the e-commerce websites which beside the physical receipt that comes with the product sometimes deliver also a digital copy on the user’s email. A note to be taken is that digital receipts, as the paper ones, are both collected and used after the payment transaction is completed.

**Gift cards** constitute another important Value-Added Service which is extensively used in the world of retail. (C. Kim, Tao, Shin, & Kim, 2010) define gift cards as the prepaid cards issued by a certain merchant and topped up with an initial fixed amount. They can be issued by a consortium of merchants which means that the card will be usable in any of the partner shops. While discussing payment cards in the previous sub-chapter, gift cards were classified as a Value-Added Service for payment and not a payment method, even though the prepaid amount on the card is used for buying goods. The reason for doing this is because of the universality of gift cards: the shops that issue the card are the only shops that can accept the card, which makes the gift card more of a merchant-specific way of acquiring goods rather than a universal payment method. Also for this reason they are sometimes seen as a subcategory of ‘closed-loop payments’. Moreover, we classify them as VAS because we want to offer the consumer the possibility to use gift cards complementary to the payment method, should he/she buy a product that is more expensive than the amount preloaded on this gift card. For these reasons we included prepaid/gift cards in the categories of Value Added Services. While not significantly used in Netherlands like in the United States, gift cards are becoming more and more popular in the Netherlands. Some shops even started virtualizing them: HEMA is the first Dutch retail company to introduce digital gift cards by partnering up with the electronic commerce company named Incomm (Incomm, 2014). The customer can collect the gift card after a transaction or receive a gift card from a friend at any certain point actually, but for redeeming them, so for actually using the amount of the card he must do that right before the payment transaction happens. So he must clearly state/choose that he wants to use that specific gift card.

By **loyalty schemes** we refer to the marketing mechanisms used by stores to promote a recurrent shopping behavior among their regular shoppers. These can consist of loyalty cards which can accumulate points with which the customer is rewarded every time he acquires a product/service from the same provider, and later can use these loyalty points to benefit from a certain type of rewards, like a discount from the original price (Buchinger, Ranaivoson, & Ballon, 2014). A notable loyalty program involving some major Dutch retailers is Air Miles, which rewards Dutch customer with discount points for shopping at Albert Heijn, Shell, V&D, Praxis, Etos and Gall&Gall (Air Miles, 2015). Many other retail shops in the Netherlands are stepping more and more into the ecommerce world, offering their customers digital loyalty solutions, but at the current time there is no universally accepted system or solution for delivering loyalty points (Expert Group Transaction, 2013). Another form of loyalty schemes in the brick-and-mortar stores is implemented not via loyalty points, but via the punch cards or the stickers, which the customer collects after every payment on a piece of cardboard/papers and the reward is given after a fixed number of purchases, or after reaching a fixed amount of spending. A different view on loyalty schemes are not towards the merchant, but towards the bank’s payment product: for example, some banks offer rewards/financial incentives if the consumer uses a certain credit card. These type of loyalty schemes are promoting loyalty for the payment product issued by the bank and they are already widely implemented, so they are out of the VAS system scope. As was the case with gift cards, loyalty points are collected after the transaction,
but they are redeemed or used before the transaction is completed, with the customer having to specifically opt for using them during the following transaction.

Another way to promote loyalty among customers is via the **bonus/ membership cards**. These are fidelity cards which shoppers can use to acquire products with exclusive discounts. An example in this sense is the Albert Heijn bonus card which is also offered as a digital product via the Albert Heijn website or their Appie mobile application (Albert Heijn, 2015). A notable effort in digitizing these cards was made by Rabobank: their recently released NFC mobile wallet offers besides the mobile payment services, the feature of photographing bonus/membership cards for the purpose of later using these card virtualizations at the merchant point-of-sale (Giesecke & Devrient, 2015). The virtualization works based on the Barcode technology presented in the previous sub-chapter. Unfortunately, the NFC solutions existing in the Dutch market do not support the collection of loyalty points, or any of the other previously mentioned VAS.

**A discount coupon/voucher** offers the customer the possibility to make a one-time acquisition of a product or service for a discounted price (Borrego-Jaraba et al., 2013). Originating in the newspaper and magazine coupons that people would cut out and use while they are shopping, they are gaining more and more popularity in the ecommerce world (Pourghomi & Ghinea, 2013). While some Dutch retailers have implemented closed-loop digital couponing solutions for their own stores, the only noticeable nation-wide solution was offered by Rabobank owned My Order platform (Expert Group Transaction, 2013). Another solution offered by the same bank is the Rabowallet which as presented earlier, besides membership/ bonus cards works only for coupons/vouchers that are based on scanning barcodes (Alfing, 2015). All mobile wallets out there offer the solution based on QR/barcodes for coupons and loyalty because of its wide acceptability for mobile usage and ease of use, but unfortunately this does not provide a couponing solution that is universal for all types of payments and all type of VAS. An alternative for digitizing coupons in the online world is just to input a certain code or a number that represents the voucher.

Having all these different types of consumer VAS, we might have to make some trade-off and develop the system accordingly, to support one or the other. These trade-off will be made after further empirical, conceptual and technical investigations.

### 2.3.2 Value Added Services for Merchants

First of all it is worth reminding that even though our focus is on VAS for end-users, because as mentioned in an earlier section we focus on B2C transactions, the VASs for merchants are also briefly presented since understanding what they consist of is relevant for motivating further decisions in our research process. These decisions are mostly related to the stakeholders and the actors needed for the implementation system. While there could be also other VAS services for merchants, in this sections we introduced the ones that our empirical research found as being most relevant.

Of course all the previously presented services also create value for the merchant on a more indirect level, since they improve their customers’ shopping experience but next we will take a look at the services that directly impact the merchant’s operations. A new concept and VAS for merchants more and more present in the e-commerce landscape nowadays (Euro Banking Association, 2014) is **replacing check-out with check-in**. Since in an earlier section we mentioned that the line between payment instruments is becoming more and more blurred, for example we can conduct online payments from a mobile device in a brick-and-mortar store, so this service could be translated in the
physical shops as well. The idea behind replacing the check-out with a check-in is to reduce friction during the consumer’s online shopping experience. In the current e-commerce payment experience, there are so many steps, forms, and authentication mechanisms to be filled in after choosing the products, that oftentimes the customer gives up halfway through the process of payment which translates into a lower conversion rate for the online merchants (Interview O.M. 2, 2015). Check-in consists of having some sort of automatic authentication (one-click) method for the customer before he/she begins the shopping experience, in order to make the payment process smoother. So the customer does not check-out his products anymore, by filling in all the payment details (like card number, or CVC number and so on), but the merchant automatically recognizes his identity when he starts shopping. In the current online context, the most well-known example of such an implementation is offered by Amazon with their “one-click-checkout”, which basically uses a similar mechanism. Amazon also offers the customer authentication service to other e-commerce merchants (Amazon, 2015). If implemented right, this service can improve the time customers need to purchase the products in an online environment thus reducing the payment friction and increasing the merchant revenues (Euro Banking Association, 2014).

Another service that merchants could highly benefit from consists of data analytics and statistics: ‘What age group are my customers? What is their spending behavior? How am I doing compared to other merchants?’ and so on – are all questions that retailers are trying to answer on a daily basis (Interview O.M. 2, 2015). Depending on their size, some merchants might have complex systems and IT infrastructures in place for this purpose, but some SMB (small-to-medium businesses) cannot afford this. As was the case with the previously mentioned VAS, this kind of service is a very delicate one with respect to the privacy of the consumers and their rights. The service would be very valuable though because it could give the merchants the change to improve and specialize their offerings.

Having classified all the Value Added Services, we have now partially answered Research Question 2, namely Sub-question 2

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<td>What are the value added services that the system might support?</td>
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Figure 6 is a diagram that gives an overview of the identified Value Added Services
Having defined and classified all type of payments and VAS relevant for the Dutch context, we now have a general overview on what technologies might be required for the new VAS system. This also means that we have fully answered Research Question 2, with its respective sub-questions.

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Taking a look at the overall picture of our research flow, we see in Figure 7 below that the first two research questions have been answered providing us with sufficient information to move on to the third research question. We further used the data from this chapter as an input for the following chapter, namely to identify the stakeholders, interests and values. The data from this chapter served as a starting point for identifying which stakeholders are involved in which type of technologies, and which similar projects has UL TS tackled with before.
The next chapter presents the Stakeholder Map, a crucial part in the VSD methodology, and in any software development effort. The methods for identifying the stakeholders, the actual actors and roles involved in the payment industry and in the VAS system development were presented, their interests were mapped and their values defined and prioritized. Finally, the values were translated into more specific design guidelines.
Chapter 3: Stakeholder Map
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3.1 Relevance

The current chapter proposes to identify the parties that are affected by the business needs or the proposed solution for the VAS system, along with their and eventually values. This is a crucial part for our research since Value Sensitive Design indicates that the stakeholders’ values should steer the technological development of an artifact. Following (Pesch, 2014) we use some of the reasons for ethical engineering to support this claim. A first one would be the value-laden character of technologies: not only do technologies create and reproduce human values, but they also have an impact on people’s actions and the decisions they make. This implies that the stakeholders’ values that should be supported or hindered by the technology must be chosen carefully. And the obvious starting point to do this is by analyzing all the parties affected by the system. A second reason to include all the stakeholder needs and values in the design would be the fact that technologies can become locked-in and path dependencies can arise. This means that switching from the dominant standard of a technology becomes very difficult because of the embedded nature of technologies in complex socio-technical systems. Even more of a reason to carefully choose which values should be supported by a potentially locked-in dominant technology. Finally, (Pesch, 2014) also points out that the social acceptability of technologies that provide real social benefits can be hindered because some cardinal values are being overlooked. This constitutes our third reason for carefully analyzing the stakeholders and prioritize among their values, interests and needs.

Taking a look at the software development industry, several authors like (Jeon, Kim, Lee, Lee, & In, 2012), (Ballejos & Montagna, 2011), (Sadiq, 2014) and others support the claim that explicitly involving stakeholders in the design of IS projects is highly important, since they are the main source for gathering requirements. (Ballejos & Montagna, 2011) also empathize the fact that each stakeholder has a unique view on the system, so it is highly important to consider each party’s view and needs. The list of authors that underline the importance of involving stakeholders in the design of technological artifacts is substantial, but we believe that these examples are sufficient to express the importance of this stage in our research.

The chapter is divided in two large sections: stakeholders’ roles and interests, and stakeholders’ values. The first one starts with a section that presents the stakeholder identification methods, explaining which of these methods were chosen and applied in our research effort. Next, it introduces the potential stakeholders. An attempt to classify these actors into communities of practice by dividing them in categories was made while introducing them. Once identified, each community’s interests will be extracted from empirical data.

The second section is dedicated to identify which values are most important for the stakeholders. A means of reasoning for selecting a specific list of values as being the most important and the trade-off mechanisms for this purpose are also offered. This is highly important because often values and interests are conflicting which makes it quite difficult to prioritize which values should the system support. The aspect is also pointed out by (Manders-Huits, 2011) as another limitation of VSD which we acknowledge but try to address as much as possible. Finally the values that are selected as being the most important will be detailed into design requirements following a hierarchical approach. This part of our research constitutes a very important stage that combines the conceptual investigations with empirical investigations.

The output of the chapter constitutes a list of design requirements grouped on values categories. This list serves as a guide for the next chapter, namely Technical Map which consists of selecting a technical
solution from different alternatives and scenarios and designing the technical architecture for that solution.

The research question that this chapter proposes to answer is RQ3: *What is the stakeholder map for the VAS system?*. The associated sub-questions are: SQ1 - *Who are the direct and indirect stakeholders? What are the communities of practice?,* SQ2 - *What are their interests?,* SQ3 - *What are their values?,* SQ4 - *What prioritization mechanisms are there in place for the values?* and SQ5 - *How can these values be translated into design requirements?*

### 3.2 Stakeholders’ Roles, Interests and Communities of Practice

#### 3.2.1 Method

Before identifying, mapping and prioritizing values a first logical step is to identify the stakeholders that could be involved in the new VAS system along with their interests and needs. (Pacheco & Garcia, 2012) rate the stakeholder identification stage as the most important stage of the requirements elicitation process. (Pressman & Maxim, 2014) also underline the fact that the identification of stakeholders, and later their interests and needs is often poorly conducted in software projects, despite its importance. A pitfall that leads to a poor stakeholder identification process, and potentially to the failure of the project is the fact that one might easily presume that the end users, customer(s) and the party developing the system are the only stakeholders involved.

Not only is this problem recognized in the software development industry, but the same lack of methodological structure for identifying stakeholders is underlined by (Manders-Huits, 2011) as a limitation of VSD as well. Moreover in VSD, because identifying human values and norms requires an even more detailed analysis and subsequently identification of all possible stakeholders. The current research acknowledges these limitations, nonetheless it proposes to address them as much as possible by combining existing methods from the research efforts conducted in the software development industry, with the methods used by existing VSD and IS papers in order to conduct a proper stakeholder identification.

To begin with, it is important to clearly define what is meant by the notion of stakeholder, how both the industry and academia perceive it. (Ballejos & Montagna, 2011) define a stakeholder in the design processes of information systems as ‘*any group, individual or organization that must take part in a project because they are affected by its activities or results*’. This is an industry-focused definition and quite limited for our purpose, in the sense that it automatically presumes that all the parties that will be affected by the activities or results of the development project can indeed be involved in the project. Obviously this is not possible in the wider socio-technical context in which the system is being developed and deployed. Social groups that might not even use the artifact but be indirectly influenced or affected by the simple existence of it in the market, cannot ‘*take part*’ in the project development. Still, they have a stake in the technological development. Most of the times even the end-user is not involved in the project, only the company that orders the technology (based on market and consumer behavior research) and the other company that creates it. It does not mean that the end-user is not a stakeholder, on the contrary it might be one of the most important stakeholder from the social perspective since he is the main user of the system. To complement this definition of the term stakeholder we focus our attention on the VSD methodology: (Friedman et al., 2006) divides the term in two more specific ones: direct stakeholders, which are the individuals/ organizations that
directly interact with the system/ artifact or its output, and indirect stakeholders which are the parties that can be impacted by the system even if they do not interact directly with it.

A combination of the industry specific term and the VSD terms was used to make the identification process as comprehensive as possible in our research. We define a stakeholder as any individual, group or organization that is in any way affected by or can influence the VAS system during any of the following phases: design, development, deployment, use and decline. A first important note regarding the coverage of our stakeholder identification is that the list of parties presented in this subchapter represents a list of potential stakeholders, depending on some implementation and architecture choices. To exemplify, based on the design choices, a payment industry specific stakeholder like the European Banks Association (EBA) might actively take part in the implementation of this system, so they would be a stakeholder in the industry accepted term, because they would be part of the project. From the VSD perspective this would also make them a direct stakeholder, because they directly interact with the system throughout the development process. In a different scenario, EBA could just be affected by the deployment of the system into the Dutch market, but not directly contribute to its development. This scenario would make them indirect stakeholders from the VSD methodology perspective. So at this stage of the research we cannot conclude just yet if any of the potential stakeholders presented will be direct or indirect stakeholders, or if they will participate in the development process or not. This very analysis of the potential stakeholders constitutes one of an input and one of the decision making factors (along with technical possibilities) for the system’s architecture. Once the system architecture is settled upon, the stakeholders that will be directly or indirectly affected, or that will take part in the development process or not, can be more easily identified. But to conclude with, we divided our stakeholders in two groups: payment industry specific stakeholders, and other stakeholders. We underline again the fact that these two defined categories do not perfectly overlap with the VSD categories of direct and indirect stakeholders or the industry-specific definition offered by (Ballejos & Montagna, 2011), but these approaches were considered while identifying the stakeholders.

Having clarified what the notion of stakeholder is, we still need to understand the different flavors of this term in the industry: stakeholders, actors and roles. For this purpose we turned again to (Ballejos & Montagna, 2011) who created a comprehensive model for stakeholders in information system design. Here, the notion of actor is introduced as a concept that ‘defines the responsibilities between agents and activities within particular processes’. So in their view, the actors are included in the group of stakeholders, but they are those specific stakeholders that actually play a role in at least one part of the process. The stakeholders that are not actors, might be affected in one way or the other from the outcome of the process, but they do not participate actively in it. If we were to make a comparison with VSD, actors would be what VSD defines as direct stakeholders, because they directly interact with the system as taking part in at least one process, while the stakeholders that are not actors are the same thing with the VSD indirect stakeholders. For this reason we will further ignore the notion of actor as a different flavor of stakeholder, and instead use the terms direct and indirect stakeholders to differentiate between the two types of stakeholders. The reason for this is because these VSD terms are more intuitive and express the involvement of that specific stakeholder more straightforward. Finally, there is the notion of role which needs to be clarified. The same authors define this term as ‘the relation between the stakeholder and the system or design process’. Basically this term concretely states the functions that each stakeholder needs to execute in the system. One stakeholder can play multiple roles in the same or different moments in time. Similarly, the same role could be played by multiple stakeholders. Some examples of roles include operator, regulator, identity provider, and so on. Just to make things more clear we exemplify by the following scenario: a clerk form the
supermarket is a stakeholder in the new system. He can be an actor (or direct stakeholder as we decided to label the actors) if the system is implemented in such a way that he interacts with the system in any way, by taking part in at least one part of the processes. If he does this, he can have the role of an operator. But when that person goes shopping and uses the VAS system, he will have the role of end-user. The reason for detailing and insisting on these terminologies is because further on in our research it is crucial to understand the difference between direct stakeholders, indirect stakeholders and roles that each of them can play.

We will further present some guidelines that served as the methodological backbone of our stakeholder identification process. A very comprehensive study conducted by (Pacheco & Garcia, 2012) makes a systematic literature review of the existing stakeholder identification methods for the requirements elicitation stage of software development. From their paper we focus our attention on their second research objective, namely finding the effective practices recommended for performing Stakeholder Identification. They selected sixteen papers that offered various solutions for this research objective and after compiling the information they defined three best practices.

First one is that all possible sources or requirements must be analyzed: to this sense, we analyzed all the remotely similar projects that have been previously conducted within UL Transaction Security. Due to client confidentiality reasons these projects cannot be detailed in the current paper, but the review helped with getting a first glance of the in-house knowledge available on which we can build our research. Combining these sources with the media sources regarding similar industry developments (which were already briefly presented in earlier chapters), we developed a substantial database regarding possible sources of requirements. An example would be two previous project in which UL TS has participated regarding a digital wallet in South America and a mobile wallet in the Netherlands. The next step in identifying possible sources of requirements constituted analyzing which UL TS team members and managers are actually able to provide requirements for our specific project. Based on this reasoning, junior consultants were not labeled as reliable sources of requirements at this stage, and the senior consultants and managers that were selected had an extensive background in the payments and mobile markets, and close contact with the payment industry stakeholders. Following the same reasoning, consultants in transit market for example, which is another market of the advisory service line within UL TS, were also not labeled as a possible source of requirements.

The second best practice suggested by (Pacheco & Garcia, 2012) is to identify user classes and their characteristics. This practice suggests using different criteria like frequency of use, skill levels, level of privilege. In this stage brainstorming was used to identify different types of users that might interact with the VAS System. The starting point for this brainstorming was based on analyzing the use-cases of the similar projects that were previously compiled into the possible sources of requirements database. After identifying all the types of individual users that interact with the system, during different action flows, they were divided in classes based on common characteristics which will be detailed upon in later sections.

Finally a third best practice is to actually identify and consult with the stakeholders of the system. From the possible requirement sources database, the main information we were interested in extracting at this stage was which stakeholders were involved in these existing projects, and what their roles were. This data was combined with the previously mentioned user classes to compile a first draft of possible stakeholders list. Because of practical reasons like the availability of the payment industry stakeholders, or the costly process of bringing them together, a first research trade-off was made and this can be pointed out as the main limitation of our study: the actual stakeholders weren’t consulted in the process of value and needs elicitation, but instead the consultants that were selected
as possible sources of requirements were interviewed as representative of these stakeholders, or as mediators. We do not see this as a big limitation though, because as mentioned earlier these consultants were selected very carefully and they all had close contact on a daily basis with the payment industry stakeholders, since they are UL’s customers. In most situation these consultants were spending even more time at these customers’ locations rather than at the UL TS headquarters. The company takes pride in knowing their customers very well and especially the advisory department where the entire service offering is based on compiling the information and needs of their clients and then offering them solutions. More details on how the interviews were created and conducted can be found in the next section, Instrument Development and in Appendix A: Interview Protocol. The following section, Payment Industry Stakeholders is actually based on the findings from these interviews.

To conclude with, during the stakeholder identification stage, the direct and indirect stakeholder and their roles were identified. Also their interests in the payment landscape and subsequently the new VAS system was explored. Suggestions from the VSD methodology were successfully applied, by combining conceptual research with existing quantitative empirical research and with specially tailored qualitative research for our specific project and research purposes. The strength of this method was increased even more by applying well documented methods from papers related to Requirements Elicitation in IS, more specifically software development since that is the technical core of the new VAS system. The sub-research question that this section proposes to answer are: SQ1 - Who are the direct and indirect stakeholders? What are the communities of practice?, SQ2 - What are their interests?

3.2.2 Instrument Development

The current section presents the development and application of the interviews, along with the design choices and measures that were taken in order to ensure a thorough data collection process.

As mentioned earlier, the research is the result of a collaboration between TU Delft and the company UL Transaction Security from Leiden, the Netherlands. Besides the trainings, specialized knowledge, previous projects and other resources, the company contributed to the research effort to a great extent by giving the researcher the opportunity to interview its payment advisors. During the interviews they were acting as representatives of the stakeholders, as it was explained in the Stakeholder Identification section of the Stakeholder Map chapter.

A first step in order to conduct interviews with the consultants was to create an interview protocol or guide. The detailed protocol can be found in Appendix A: Interview Protocol. The nature of the interview is semi-structured, which means that open-ended questions were asked during a natural conversation with the interviewee. This choice was made because of the interview purpose, which is exploratory. As (Creswell, 2009) points out, these type of interviews are suitable for exploring problems that are relatively new, like the VAS system is, and while they are not as constricting as a survey, they still provide more uniformity among the interviewees’ answers than an unstructured interview. With this balance of order and freedom in mind, the questions, while they were not exactly the same from one interviewee to the other, tapped into some predefined areas and domains which will be exposed in the later paragraphs.

The second step was to set up the logistics of the interview, namely all the actions conducted before the interview itself. Among others this part consisted of: contacting the consultant to briefly inform
him/her on the research topic and ask him/her if they want to participate in the research; find an unbiased location and a suitable time for both parties; confirm the interview by booking the meeting via Microsoft Outlook; send out reminders and in some cases reschedule the interview; prepare the hardware (Samsung Galaxy S3 smart phone) and software (Smart Recorder for Android 4.1) tools for recording the interview.

The interview itself consisted of five parts: introduction and formalities, warm-up, main section, cool-down and conclusion. The steps and specific areas that each part tackled with and the entire interview structure can be found in Appendix A: Interview Protocol. In the following paragraph we will detail just the main section.

The main section of the interview is focused on two wide topics: system characteristic and involved actors. During the first part, the researcher wanted to get the subject’s view on specific characteristics of the VAS system, or the general features of a boundary object that could constitute the essence of such a system. This part tackled mostly with characteristics and values that were identified as being relevant to payment systems during a previous literature review. The reason for involving the payment system characteristics was firstly because the VAS to be designed are closely intertwined with the payment process itself, and secondly because there is no empirical research on the relevant characteristics of the VAS system itself. The second part of the interview approached the system from the stakeholder involvement perspective. The purpose was to elicit which stakeholders could or should be directly involved in creating the system, and which other parties could be potentially affected. For this stakeholder involvement part, the interviewer used an initial draft list of possible stakeholders that was developed based on conceptual research. More details on how this list was develop can be found in the Method section of the Stakeholder Identification subchapter from the Stakeholder Map chapter. Also the researcher tapped into what kind of interests or incentives these parties may have to collaborate or jointly create these services.

It is worth mentioning that the interview protocol was built around three type of questions: essential questions, namely questions that directly address the research objectives, extra questions which are rephrasing of the essential questions for validity, consistency and clarification purposes and finally probing questions, which are questions that allow the subjects to elaborate on their answers (Creswell, 2009). While the essential questions and the areas of interest were defined beforehand, the extra and probing questions were generally phrased on the spot during the interview in accordance with the responses the researcher received. As a consequence they are not presented entirely in the appendix. As a general rule complex questions (long, unclear questions) were broken down into smaller questions, and double-barreled questions (that contain more than one issue) along with affectively worded questions (questions that generate an inappropriate emotional response) were completely avoided.

Finally, after the interview was conducted the recordings were saved and transcribed into corresponding Microsoft Word documents. These documents were later imported in the Mendeley for referencing purposes. To ensure the anonymity of the interviewee, the name of the interview consists of “Interview + (abbreviation of the function of the interviewee)”. Because of the exploratory nature of the interviews, the research chose to present the findings throughout other chapters like Stakeholder Map and Technical Investigation, and not to present them in a separate section. This choice was made because the final output/deliverable of the thesis is a technical architecture designed following a VSD approach, not interview findings as it is the case with other empirical papers. The interview findings were merely tools to support technical and implementation decisions, not the core of our research.
11 consultants were interviewed over the period of 3 weeks. The interviewees were having the following functions: 2 operations managers (heads of the Europe advisory department of UL), abbreviated O.M., 8 senior consultants (advisors having more than 3 years of experience in the payment industry) abbreviated S.C., and 1 consultants (having between 1 and 3 years of experience in the payment industry) abbreviated simply C.

### 3.2.3 Payment Industry Stakeholders

To begin with, it must be reminded that the current research focuses only on VAS for digital transactions, as cash payments are outside the scope of our research. Because the new VAS system needs to accompany all types of digital payments, a first logical step in identifying the payment industry possible stakeholders for the VAS system is to analyze the direct stakeholders that take part in a generic digital transaction process. All, or very few of these stakeholders could actually be involved in the VAS system, but as mentioned earlier, the focus of this chapter is to analyze as many potential stakeholders as possible and combining this outcome with stakeholders involved in similar existing projects, both within and outside UL, these stakeholders can be filtered and their interests can be identified.

Firstly, we must identify the roles that take part in a digital transaction. Detailing on each role, we will identify the actual stakeholders that can play each role. Following that, each of the stakeholders will be placed into the appropriate community of practice and each community’s interests will be presented, as they resulted from the interviews with the UL TS consultants.

A community of practice (CoP), as (Wenger, 1998) defines it is ‘a group of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.’ Every CoP has to have three elements. First there has to be a common domain, so basically a common area of interest. Then, it has to have the structure of a community, which means that members actively engage in interaction and share information in the pursuit of the common goal. Finally, it has to have the practice element which means that the members are active practitioners of an action, a competence that distinguishes them from other people, a share practice.

Figure 8 below depicts a basic digital payment scenario, as defined by (Weber, 1999). Several other authors like (Ondrus, 2003) and (Buhan, Tan, & Phases, 2002) identified the same four parties involved. In the payment industry, this is known as the ‘four corner model’, based on the number of roles present in the scenario. (Treasury Alliance Group, 2014)
The role of Payer, otherwise known as Customer, is the party that intends to acquire a certain good or service. This party is the client of a financial institution, which is represented by the Issuer in Figure 8. This institution provides the needed financial services for the Customer, like access to the payment account and payment products (payment apps, payment cards and so on). In a similar and symmetric way the Payee, otherwise known as the Merchant, is provided with financial products and services by the Acquirer. They provide the Merchant with POS (point-of-sale) terminals, also they collect the payments on behalf of the merchant. In our case, the Payee can be anything from a brick-and-mortar store to a virtual shop or a vending machine.

As depicted above, between the Issuer and the Acquirer there is a financial network represented by the organizations that play a role in the information and fund transfers between the two financial institutions. This network is quite different for each country, but there are some common roles which can be identified. First, there is the financial Scheme, which assures standardization and interoperability to create cooperation between the Issuers and Acquirers. This can be a local/national scheme, or a global one. There is also a scheme Processor, which handles the clearing and settlement between them. Other roles in the financial network include: regulatory bodies, national banks, and other monetary institutions.

We will further detail on each of these roles in order to identify the specific institutions, the direct stakeholders for the Dutch retail payments sector. Not only are we trying to identify them, but also their interests as they were reflected in the interviews. We underline that we analyze only the retail payments because for commercial banking or for security transactions other stakeholders are involved.

The Customer role and his interests are pretty straight-forward. As mentioned in the previous chapter, we are focused only in B2C transactions, which means that the customer can only be an individual person, not a business. From this role we can define an initial community of practice, namely the End Users. These are the individuals that are the Customers of a financial institution, meaning they hold a current account and a payment instrument, and want to acquire physical or digital products or services from a Merchant. They want to get a better paying experience which ultimately translates in a better shopping experience. This also means decreasing the hassle brought on by the current paper coupons, receipts and cardboard loyalty card. This is a strong incentive, on which the adoption of mobile payments is based, as (Augsburg & Hedman, 2014) illustrate in their study. Integrating VASs with mobile payments is the entire engine that gives mobile payments an advantage over card payments and having the possibility to only take your phone with you while shopping, while still benefiting from all the perks of the paper/ cardboard services is an appealing idea for the future (Interview S.C. 3, 2015). Another point the customer is interested in is having them available at all times, which does not happen when the user forgets his loyalty card or coupons at home. Obviously, the customers want to benefit from these services in a secure and private way. This means that they do not want to lose their reward points or coupons, or the merchants to know their identity and their shopping behavior. The users also want a great user experience and this factor is crucial for their adoption of the system (Interview S.C. 6, 2015). But not only does this friction in the payment process happen in the physical shops because of physical VASs, but it also happens in the online world. Studies show that because of the cumbersome identification and authentication process, a lot of customers drop out from the online shopping process (Interview O.M. 2, 2015). Other findings from our research indicate that while customer would like all these services, they are not willing to pay extra for it (Interview S.C. 4, 2015). Also, regarding the consumers, Netherlands is not so much a couponing country, compared to the United States for example (Interview C. 1, 2015). Loyalty points, receipts and other VASs are visible,
but couponing is not that important for Dutch consumers (Expert Group Transaction, 2013). Table 2 below summarizes the interests of the communities of practice playing this role.

<table>
<thead>
<tr>
<th>Role</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Community of Practice</strong></td>
<td><strong>End - users</strong></td>
</tr>
</tbody>
</table>
| **Interests in digital VAS system** | • Hassle-free VAS user experience  
• Mobile payment improvement  
• VAS always available  
• Seamlessly integrated with payments  
• Integrated with both brick-and-mortar and web-shops  
• Privacy aware  
• Secure way of storing and using VAS  
• Offered as a free service  
• Loyalty points > couponing in the Netherlands |

*Table 2: Customer - CoP and interests*

The next role, of Merchant, can be played in our case by any Dutch shop, ranging from hypermarkets to SMB (small-to-medium businesses) or even vending machines. Basically any party from which the Customers can inquire products or services from. Two communities of practice which are relevant for the VAS system can be derived from this role: firstly there is the community of the stores business executives, which for simplicity we will call Store Executives. These are the owners or the employees that make the business and strategic decision for the retail stores. Secondly there is the Sales Assistants community of practice, namely the employees who operate the cash registers in the brick-and-mortar stores.

Regarding the first community of practice, the Store Executives, we need to make a differentiation between the small and the large merchants in terms of the executives’ interest for participating in the banks-centric VAS system (Interview O.M. 1, 2015) (Interview O.M. 2, 2015)(Interview S.C. 2, 2015): the large merchants like Albert Heijn already have their complex infrastructure (servers, databases, apps, websites and so on) in place to develop, maintain and offer these VASs by themselves to their customers. For the executives of these large players, the service offering itself would not constitute a sufficient incentive to join the bank-centric system (Interview S.C. 5, 2015). For them other incentives are more important, like decreasing payment friction at the cash register (Interview O.M. 2, 2015). Having shorter queues at the cash register would translate in more sales. And this can be achieved by automatizing as much as possible the value-added services. Another incentive for them would be to access new customers with their programs (Interview O.M. 2, 2015): if they use their own apps/platforms they are addressing only their existing customers. If they use a bank-centric platform, they have access to new customers that are customers of the bank but not yet of their shop. This means that participating in a bank-centric approach would bring them more customer volume (Interview S.C. 6, 2015), which is a crucial incentive. There is a thin line between using this platform for visibility in new market niches, and using it as a marketing platform that spams the bank’s customers which is why the designers of the system will take extra precautions to this end. This visibility incentive holds also for smaller merchants, but the previous incentive on the other hand does not hold. The reason is because these small shops have a significantly smaller inflow of customers, so
increasing operational excellence for reducing queues might not constitute an incentive. However, for the owners of these businesses, because they cannot afford to create their own infrastructure for VAS, the service itself would be a powerful incentive (Interview S.C. 6, 2015). For online merchants, regardless of the size, decreasing the payment friction in the online environment is an important aspect (Interview S.C. 1, 2015). This means that if the online identification and authentication process is made smoother and less cumbersome, less customers will give up while trying to check-out from the online shop and thus merchants will have a higher conversion rate (Interview S.C. 1, 2015). A common interest of all Store Executives, regardless of the size or nature of the store is that the new system is usable by all customers no matter what their issuing bank is. The reason is because these executives would not change or adapt their infrastructure for a system which only supports 30% (for examples) of their customers, merely the customers for one of the three major Dutch banks (Interview S.C. 4, 2015). Another request of the business executives is that the newly designed VAS system is easy to integrate with their existing payment infrastructure. Or if it involves changes in their infrastructure, the changes are minimal (Interview S.C. 2, 2015). Another aspect would be the security of the system: they do not want people to be able to falsify their digital offers (Interview C. 1, 2015). Also, the flexibility of joining the system and the degree of customization of the VAS offers is important (Interview S.C. 2, 2015). One more important aspect collected from our research is the brand visibility: while using a bank-centric platform does provide the merchants with the previously discussed benefits, one of the merchants’ main concern is how the branding of the service is done (Interview O.M. 1, 2015). They want the customer to be aware when he is using their loyalty card, their coupons, which are branded with their logo and name (Interview O.M. 2, 2015). They do not want to participate in a scheme where the bank rewards their customers with ‘bank-branded-loyalty-points’, like ING Rentepunten (Interview O.M. 2, 2015). So this is also one aspect to consider when designing the system. Finally, there is the ownership of data: store executives want to own the shopping data of their customers and do not want to share that with anybody (Interview O.M. 1, 2015) (Interview C. 1, 2015). Above this they are interested in receiving many data analytics services like: the age groups of their customers, or the time of shopping, peak hour, and how they are doing compared to their competitors in this area (Interview O.M. 1, 2015), (Interview O.M. 2, 2015), (Interview S.C. 5, 2015).

The second VAS-relevant community of practice related to the role of Merchant are the Sales Assistants, otherwise known as salesclerks. They have a more straight-forward interest in the system: the usability aspect from their perspective. Operating the system before, during and after they scan the customer’s products should be fairly simple. The previous merchant-related community of practice also shares this interest, because they do not want to invest a lot time for training new personal to use a complex VAS. Table 3 below summarizes the interests of the Communities of Practice on the Merchant’s role.

<table>
<thead>
<tr>
<th>Role</th>
<th>MERCHANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of Practice</td>
<td>Store Executives</td>
</tr>
</tbody>
</table>

56
Interests in digital VAS system

- Decreasing payment friction
- Increasing conversion rate
- Brand recognition
- Flexible way of joining the scheme
- High degree of VAS offer customization
- Infrastructure for digitizing their VAS
- Access new customers via the system
- Compatibility of the system with all customers and banks
- Compatibility with existing payment infrastructure
- Minimal integration changes
- Security and anti-fraud mechanisms for offers
- Customer awareness when using VAS
- Ownership of data
- Analytics service
- Easy to train clerks to work with it

Table 3: Merchant - CoP and Interests

The Acquirer role is closely related to two communities of practice: Brick-and-mortar Acquirers and Payment Service Providers. By these communities of practice we refer to the executives making the business and strategic decisions on behalf of those parties. As mentioned earlier the purpose of an acquirer is to provide payment services to the merchants. The brick-and-mortar acquirer community is represented in the Dutch context by the specialized acquiring companies CCV and Atos and by one of the banks, namely ING (Interview S.C. 6, 2015). The reason for including the bank in this community as Brick-and-Mortar Acquirer and not creating a separate community of practice is because: first of all only this one bank is involved in the acquiring part for the Dutch payment market, so there is not a ‘community of banks’ that provide acquiring services. The second reason is because from this angle we do not look at ING as the consumer bank that we all know, but we look at it as a company that has the same interests and practices as the two specialized acquirers. For the online commerce world, the payments are processed by the second community of practice, the Payment Service Providers (PSP). In the Dutch ecosystem these are Adyen and Global Collect (from the Ingenico Group). Some PSPs also want to move into brick-and-mortar world of acquiring, and the other way around, some parties offering payment processing services in the physical shop want to expand their businesses in the online world. This is not such a surprise considering the blurry lines between different payment means and contexts: for example conducting an online payment from a mobile device in a physical store would totally explain the presence of a PSP at the physical payment terminal level. Regardless of analyzing the brick-and-mortar or the e-commerce world, the acquiring parties here have the same interest, which is the reasons why we will analyze the interests and treat these communities as a combined one. A first common interest is to provide acquiring services to as many merchants as possible, in order to increase their business volume (Interview S.C. 1, 2015). This translates into having a system as flexible as possible so that many merchants can join. Also, the system should be
compatible with as many as many payment instruments as possible, and as easy to integrate with the merchant backend and ECRs (Interview O.M. 1, 2015). As for modifying something on the payment infrastructure level (including terminal), this is something Acquirers do not want to do for the VAS system, because besides hindering the merchant’s from adopting the system, it would also make it more costly and complex for the them to provide merchants with new terminals and make sure the changes are supported via the infrastructure (Interview S.C. 5, 2015), (Interview S.C. 6, 2015), (Interview S.C. 8, 2015), (Interview C. 1, 2015). Another aspect is that by processing the payments on behalf of the merchant, they also own valuable data on the overview of their customers’ (which are the merchants that they provide services to) business. They are in the best position to offer the data analytics and statistics services for merchants, as identified in the section 2.2 Value Added Services from Chapter 2: Domain Background. They can provide insight on the age groups of the merchant’s customer, the area they come from, also on how the merchant is doing in terms of sale volumes compared to other similar merchants, or other merchants in the same geographical area (Interview O.M. 2, 2015). Of course all these services would bring extra revenues for these acquirers. Also in the new VAS system it needs to be mentioned that Acquirers might play an important role, since they have a direct communication channel with the Merchants (Interview O.M. 1, 2015), (Interview S.C. 6, 2015).

In the brick-and-mortar world, the Acquirer serves another purpose besides processing transactions: providing the POS terminals for the merchants. But for this purpose there is another community of practice involved. These are the Terminal and ECR Vendors, the companies that design and manufacture the POS terminals, and that integrate the ECRs into the merchant’s backend, since some Acquirers do not do that themselves. In the Netherlands Verifone, Ingenico and CCV are the biggest terminal vendors. As we can see, some PSPs and Acquirers also produce terminals, but not all of them. For security reasons, all these terminals have to be compliant with a lot of standards and regulations, so the freedom they have to actually modify the specifications of these devices is quite limited. But they would prefer a VAS system for which they have to produce new standardized terminals so that they increase their sales. If it were the case to update the existing ECRs, these vendors would prefer to do it remotely (Interview S.C. 7, 2015), so the connectivity of system is also important. Table 4 below summarizes the interests of the Communities of Practice on the Acquiring side.

<table>
<thead>
<tr>
<th>Role</th>
<th>ACQUIRER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of Practice</td>
<td>Brick-and-Mortar Acquirers &amp; Payment Service Providers</td>
</tr>
<tr>
<td>Interests in digital VAS system</td>
<td>• Expand business into the online world, respectively into the physical world</td>
</tr>
<tr>
<td></td>
<td>• Compatibility with different payment instruments</td>
</tr>
<tr>
<td></td>
<td>• Minimal changes to the existing terminals and ECRs, preferably done remotely</td>
</tr>
<tr>
<td></td>
<td>• Increase revenue by having as many merchants as possible</td>
</tr>
<tr>
<td></td>
<td>• Easy ECR/ merchant backend integration</td>
</tr>
<tr>
<td></td>
<td>• Own valuable customer data</td>
</tr>
<tr>
<td></td>
<td>• Bridge the gap between the Merchant and Issuer</td>
</tr>
</tbody>
</table>

Table 4: Acquirer - CoP and Interests
After the Acquirer, the transaction reaches what was depicted as the financial network in the model by (Weber, 1999). A first role mentioned there was the community of the Schemes, which set the rules and standards for the cooperation of the two financial institutions. But in the case of the Netherlands we first must take a look at the Processor, namely Equens, a public limited liability company governed by an European body of law, that handles all type of retail transactions and SEPA products (Committee on Payments and Market Infrastructure, 2012), more precisely the clearing and settlement part between Acquirers and Issuers, provided they are not the same party obviously, like in the case of ING. If the transactions are international, Equens uses a switch to forward the transaction towards the global schemes, which are Visa and MasterCard. Regardless we talk about domestic or international payments, it is very difficult to actually change something on this level, like the structure of the messages being processed. Also, it is not in the interest of the local processor Equens, not more so of the global schemes Visa and MasterCard, to actually change their specifications in order to support standardization for messages with new data related to loyalty points or other VAS (Interview C. 1, 2015). Other regulatory and standardization bodies are: EBA, the De Nederlandse Bank, EMVCo, Dutch government, Dutch payment association and many others (Committee on Payments and Market Infrastructure, 2012). They are highly interested in standardizing payment and also other VAS related to identity providing (Interview S.C. 1, 2015). One interest of the Dutch government specifically is also protecting the privacy of its citizens since they voted at the end of May 2015 a decision to investigate issues like the privacy of account holders in the case of Google Wallet and Android Pay (Tweede Kamer, 2015). So, besides Schemes, another two communities of practice can be identified on this side of the four corner model: Processors and Regulation and Standardization Bodies. As we will see during the Technical Investigations chapter, some of these parties might play a role in offering a potential technical solution for the VAS system. The Table 5 below summarizes the position of the financial network regarding the interests they could have on the VAS system.

<table>
<thead>
<tr>
<th>Role</th>
<th>FINANCIAL NETWORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of Practice</td>
<td>Schemes</td>
</tr>
<tr>
<td>Interests in digital VAS system</td>
<td>• Standards for cooperation between Issuers and Acquirers</td>
</tr>
</tbody>
</table>

Table 5: Financial Network - CoP and Interests

Finally, the last role in the four corner model is the Issuer, and is one of the most important roles in our research. Two communities of practice were identified, based on the stakeholders that can play this role: Retail Banks and Payment Institutions. Although they have the same purpose, namely to offer the best payment products and experience to their customers, they have slightly different positions, in the sense that they are competitors. Banks feel threatened by the new players that have entered the scene, these new Silicon Valley companies like Paypal, Google, Apple and so on that form the Payment Institutions community of practice. Up until recent time banks weren’t focus so much on the customer journey until these new high-tech companies started offering better payment services
with a higher focus on the customer experience (Interview O.M. 1, 2015). An example in this sense is Google Hands Free payment which proposes a seamless, hassle-free payment experience. Or other payment institutions that offer additional services on top of payment. So banks need to deliver more value to their customers (Interview O.M. 1, 2015) and for that they need to shift their mindset towards an IT company’s approach by collaboration with other players (Interview O.M. 2, 2015). At this point, this is not even a matter of monetizing the value added services, or of gaining competitive advantage as a bank, but it is a matter of survival in the new digital world (Interview S.C. 4, 2015). In light of new EU regulations (PSD2, MIF), soon enough banks will be obliged to open up APIs to offer 3rd parties the possibility to access a customer’s account data, presuming of course that the customer has explicitly agreed for that specific party to access his/her data. For example if a customer wants to buy alcohol online, before the payment is completed the web shop might “ask” the bank if the customer is over the age of 18 or not. In a few years, once the regulation is adopted, banks will not have a choice but to collaborate with these 3rd parties. The idea is that until then, they might take advantage and try to monetize this in some way by viewing it as a window of opportunity, since blocking the collaboration will become more and more difficult (Interview O.M. 2, 2015). Building a platform on top of their payment infrastructure through which they could offer different services to other parties might offer them a business case (Interview S.C. 4, 2015). This is one of the reasons why banks want to offer to their customers VAS on top of their payment products, and even for other parties like merchants.

One of the first concerns in opening up APIs for providing customer data to 3rd parties is the security of the systems. Openness translates into vulnerability for malicious attacks, if it is not done properly. At the same time a certain degree of openness could improve the services offered by attracting a community of developers that could create extra services on top of the core ones (like finance analytics plug-ins for users) (Interview O.M. 1, 2015). But the line not to cross is thin, so banks are very concerned with the security implications of opening the APIs. Another point of concern is related to the privacy of their customers. They do not want to disclose information of their customers which might lead to targeted marketing or customer profiling (Interview S.C. 2, 2015) (Interview C. 1, 2015) (Interview O.M. 1, 2015). Finally, connected to these two concerns is the trust of their customers. Last year, an executive from one of the top three banks in Netherlands made a press statement saying that they want to commercialize their customers’ data and that they are ready to do it, so they do have the capabilities to leverage this knowledge. Eventually they didn’t follow through, because it was not well seen by the public (Interview S.C. 2, 2015). Nonetheless very comprehensive studies conducted by the banks in Netherlands show that their customers still trust them with their data more than they trust other parties (Interview O.M. 1, 2015) (Interview S.C. 1, 2015) (Interview S.C. 4, 2015). This is something banks do not want to lose.

So banks have all this valuable data and customer pool which they want to leverage, but do not want to lose the trust of their customers. A solution would be to sell only partial relevant information to merchants, but under a tokenized form in such a way that if several merchants get together, profiling the customer is impossible because only the bank knows the true identity of that customer (Interview S.C. 1, 2015) (Interview S.C. 4, 2015) (Interview S.C. 8, 2015). Because for offering any type of VAS to a customer (receipt, loyalty points, bonus and so on) the identity of that customer needs to be verified. And the bank is in a very good position to do this, without disclosing any sensitive data to the merchants (Interview C. 1, 2015) (Interview S.C. 1, 2015) (Interview S.C. 2, 2015) (Interview S.C. 4, 2015) (Interview S.C. 5, 2015) (Interview O.M. 1, 2015). Another way of increasing the trust of the customers and protecting their privacy is by explicitly asking them for consent (Interview S.C. 3, 2015) (Interview S.C. 4, 2015) and providing an explicit transparent explanation on how their data is going to be used and what the implications could be. The banks also want to give the customers the freedom to personalize the value added services (Interview S.C. 4, 2015). Last but not least, it is in the bank’s
interest to offer these extra services for every payment instrument, regardless we are talking about online, mobile or card, since every customer might prefer a specific one more than the other (Interview S.C. 3, 2015) (Interview S.C. 4, 2015) (Interview O.M. 1, 2015). Banks say: “today we are in an ecosystem that is really card centric. We praise for the creation of an account centric ecosystem”, so they do not want to focus on a specific payment instrument which might be outdate in a certain period (Interview S.C. 1, 2015).

Finally, banks are interested in offering these kind of services for as many merchants as possible, so that the value added for the customer is bigger. For this reason they collaborate to create a standardized system which is easier to integrate with every merchant (Interview S.C. 4, 2015). This will also ensure merchant interoperability (Interview O.M. 1, 2015), raising the chances that the system is adopted by the merchants. Changing elements from the payment infrastructure is something banks do not want, because they are aware that this would be a huge setback in the roll-out of the system. This is because merchants and acquirers are reluctant in updating and/or recertifying the payment infrastructure, as it is a very costly and cumbersome process (Interview C. 1, 2015) (Interview S.C. 1, 2015) (Interview S.C. 2, 2015) (Interview S.C. 3, 2015) (Interview S.C. 4, 2015) (Interview S.C. 5, 2015) (Interview S.C. 7, 2015) (Interview S.C. 8, 2015) (Interview O.M. 1, 2015) (Interview O.M. 2, 2015). So the suggestion is that the payment channel stays separate from the VAS channel.

As for the Payment Institutions community of practice, their interest is to have a standardized VAS system on global scale so that they can create value added services for multiple countries, in which case they could also penetrate the market in the Netherlands. They also want to “free-ride” by building on the existing infrastructure that the banking industry has create (Interview O.M. 2, 2015). Since the payment institutions are poorly represented in the Netherlands, as show in previous chapters, we will not further insist on mapping their interest because they do not contribute or influence the development of the local Dutch VAS system in any way. Table 6 below summaries the interests of the two communities involved on the Issuing side.

<table>
<thead>
<tr>
<th>Role</th>
<th>ISSUER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of Practice</td>
<td>Retail Banks</td>
</tr>
</tbody>
</table>
| Interests in digital VAS system | • Offer hassle - free digital service to keep up with payment institutions  
• Seamless integration with the payment process for a better customer experience  
• Security against hackers  
• Protect the privacy of their customers  
• Maintain the trust of their customers  
• Offer the services for online, mobile and card payments  
• Standardized system to attract many merchants  
• Minimal changes to the existing payment infrastructure | • World-wide standardization  
• Build over the existing payment infrastructure |

Table 6: Issuer - CoP and Interests
The next role specific for the payment industry, is the **VAS Provider** role. This is not present in the digital transaction flow, because it is not a role related to the payment process itself. The purpose of this party is to digitize the merchant’s offers, since not all merchants are in the position to have a platform and app for doing this, like Albert Heijn is for example. There are two reasons for the need of this party: first of all banks do not want to personalize and digitize merchant offers, compute rewards, store points and so on, because it is none of their core business (Interview S.C. 1, 2015) (Interview S.C. 5, 2015). Secondly, the merchant wants to keep this as close as possible to him, and since he does not have a direct connection with the Issuers, this would be more difficult (Interview S.C. 4, 2015). Several communities ranging from **Brick-and-mortar Acquirers, Payment Services Providers** and **Specialized Digital Service Providers** can play this role, because of their close contact with the merchant (Interview S.C. 1, 2015) (Interview S.C. 4, 2015). In the current Dutch context, although acquirers are willing to expand their business into this customer VAS area, besides the analytics merchant VAS area earlier presented, **Specialized Software Companies** are usually the ones fulfilling this role. Two main companies represent this stakeholder in the Netherlands, namely Intersolve, which is the operator behind the Air Miles loyalty scheme (Interview S.C. 6, 2015) and My Order which is the company responsible for the largest loyalty/coupons platforms in the Netherlands (My Order, 2015) (Interview O.M. 1, 2015). Because Brick-and-Mortar Acquirers and Payment Service Providers share the same interests with Specialized Software Companies in playing this role, their interests will be commonly treated. Our research shows that this VAS Provider role is crucial for the VAS system, as all interviewees indicated. The reason is because it is not a bank’s core business to handle and manage digital loyalty points, coupons, vouchers and so on for merchants. These stakeholders are specialized in doing this, and they already have a lot of experience and interaction with the merchants for this purpose. As mentioned earlier, the bank’s interest is to seamlessly integrate these digitized offerings with their payment instruments. For this purpose collaboration and cooperation has to be established between the issuing banks and these CoPs. Some issuing banks already anticipated this, like Rabobank when they acquired 80% of My Order’s shares in 2012 (My Order, 2015). These three communities of practice have multiple interests in the VAS system: first of all they want the system to be compatible across all issuing banks (Interview S.C. 5, 2015) and between merchants (Interview O.M. 1, 2015). Secondly they want a system that is configurable and modular, so that they can seamlessly digitize the merchants’ offerings without too much development and integration effort (Interview S.C. 2, 2015). This would increase the number of merchants that are their customers, their business volume, and eventually their revenue. The same kind of scalability is required for the integration with the merchants’ ECRs (Electronic Cash Registers) since the VAS Provider might be responsible for this because they are offering the service to the merchants (Interview S.C. 1, 2015). Table 7 below summarizes the interests of the communities of practice that could play the VAS Provider role.

<table>
<thead>
<tr>
<th>Role</th>
<th>VAS Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of Practice</td>
<td>Brick-and-Mortar Acquirers &amp; Payment Service Providers &amp; Specialized Software Companies</td>
</tr>
<tr>
<td>Interests in digital VAS system</td>
<td>• Accepted across all issuing banks and merchants • Configurable for digitizing merchant offers • Attract new merchants as customers • Seamless integration into the merchant’s ECR/ backend</td>
</tr>
</tbody>
</table>

*Table 7: VAS Provider - CoP and Interests*
Payment Consultants are the final relevant community of practice we have identified from the payment industry. They play the role of MEDIATOR, because the other parties like banks do not have all the necessary in-house knowledge (Interview S.C. 3, 2015). They are represented by the companies that bring all the previously mentioned stakeholders together. Their focus for the system is that all of their customers are satisfied with the implementation of the system, and their needs and interests are listened to and balanced. Besides, they are the people designing the system, making it secure, acceptable, and standardized, measuring the compliance, or testing it (Interview S.C. 5, 2015). The payment consultants we considered for this project are the employees working in the Advisory Service Line of UL Transaction Security, where the current research was conducted. Table 8 below summarizes the interest that the Payment Consultant which play the Mediator role, have in the VAS system.

<table>
<thead>
<tr>
<th>Role</th>
<th>MEDIATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community of Practice</td>
<td>Payment Consultants</td>
</tr>
<tr>
<td>Interests in digital VAS system</td>
<td>• Secure system</td>
</tr>
<tr>
<td></td>
<td>• System is accepted</td>
</tr>
<tr>
<td></td>
<td>• Standardization</td>
</tr>
<tr>
<td></td>
<td>• Test the system</td>
</tr>
<tr>
<td></td>
<td>• Measure compliance</td>
</tr>
</tbody>
</table>

Table 8: Mediator - CoP and Interests

3.2.4 Other Stakeholders

Looking beyond the roles and the stakeholders from the payment industry we have identified several other stakeholders which we have grouped in communities of practice. A first one is that of the Software Developers: this category includes both the developers of the system itself, and the app developers that can build different apps or widgets on top of the VAS system. Depending on the design choices for the system, it can be opened in a platform-sense, where 3rd parties can create new content for the users, like widgets or apps for analyzing the user's data, for example expenses (Tiwana, Konsynski, & Bush, 2010). Or it can be fixed and closed to external developers. The first approach, besides being the developers’ favorite one, has the advantage of offering different monetization options, and a richer user experience while the second option has a more increased security since the system is opened only to verified and trustworthy external parties. In any case, the developers would want system to support libraries and APIs for integration with other software modules, in a safe and secure way, like the ones from VAS Providers. Another aspect to consider from the developer’s perspective, is the type of platform that supports the system: if a choice is made for a mobile implementation, will it be implemented on Android OS, iOS, Windows Phone OS or Blackberry OS? Each OS has a different characteristics, SDKs and IDEs, so the developers each choice addresses a wider or a smaller range of 3rd party developers. More considerations on this aspect will be presented during the Technical Investigation chapter.

Another community of practice consists of MNOs (Mobile Network Operators). In Netherlands three major companies are the leaders in this market: KPN, Vodafone and T-Mobile. Even though there has been proven interest from their side in mobile payments, we classify them as Other Stakeholders since their core business in not payment but providing telecommunication services. In the Netherlands, for
the mobile payment domain, the most notable initiatives include the Vodafone Wallet (Appeldoorn, 2014) and the ‘Mobiel Betalen Nederland’ project. None of these initiatives actually became a dominant standard, and the MNOs are quite ‘late to the payment game’ now (Interview S.C. 2, 2015)(Interview S.C. 4, 2015). In terms of providing digital identity on the other hand, mobile network operators could play a role (Interview S.C. 5, 2015) (Interview S.C. 7, 2015) (Interview C. 1, 2015), in which case they would compete with banks for the role of identity provider. Mobile Connect is an initiative powered by GSMA and supported by 17 mobile network operators in 13 countries as of March 2015 (GSMA, 2015), and it consists of a digital identity service offered by the MNOs for their customers to authenticate in the online world. The system works based on the customer’s SIM card which can uniquely identify the customer. At the same time MNOs use a token to identify the customer to the shops, for privacy protection. Offering this customer identification for the merchant is the interest MNOs have in the VAS system (Interview S.C. 7, 2015). Unfortunately, Mobile Connect is not yet implemented in Netherlands. Also, introducing a new direct stakeholder in the system though would only make the VAS system’s release to the market more difficult and we prefer to keep involved as few parties as possible. A final last reason would be that historically speaking, collaboration between banks and MNOs hasn’t been the most fruitful in the Netherlands, as previous failed joint ventures for releasing mobile payments proved (Sarah Clark, 2012). Our research on MNOs concludes that they should focus on their core services which is network service provider (Interview O.M. 1, 2015).

Finally, we have the OEM (Original Equipment Manufacturers) community of practice, or simply put the mobile devices manufactures like Apple, Samsung. While these players have developed their own mobile payment apps and systems, which also include to some extent VAS, we do not see any of these systems in the Netherlands (Interview O.M. 1, 2015). This is because these global payment methods, like in the case of Payment Institutions, have to be adapted to each countries legislation, since EU regulations are different than the ones in the United States of America (Interview C. 1, 2015). So are the payment mechanisms and infrastructure which is why they would like a VAS system that is standardized worldwide (Interview S.C. 4, 2015). As this is very difficult to do, for this reason we see them in the United States and recently in UK, but it might take a long time before they decide to actually invest the money to adapt their systems in a small country like the Netherlands. A second reason would be that the public’s general perception and trust is more towards banks when it comes to payments, rather than alternative payment providers (Interview O.M. 1, 2015)(Interview S.C. 4, 2015)(Interview S.C. 8, 2015). So our research proves that they would not have an interest in a local VAS system implemented by banks, more than simple providers of handset equipment, should a handset implementation be chosen. Table 9 below summarizes the interests that other stakeholders have in the VAS system.

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Software Developers</th>
<th>MNOs</th>
<th>OEMs</th>
</tr>
</thead>
</table>
| Interests in digital VAS system | • Opened for development  
• APIs and SDKs  
• Secure platform  
• Supported on multiple OS platforms | • Identify customers at merchant  
• Charge as many internet network services as possible | • World-wide standardization  
• Compatibility of the system with their phone technologies |

Table 9: Other Stakeholders - CoP and Interests
Having identified the payment industry and other stakeholders, and dividing them into communities of practices while sketching their interest we have covered the first two sub-question from RQ3: *What is the stakeholder map?*

<table>
<thead>
<tr>
<th>Research Question 3</th>
<th>What is the stakeholder map?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Sub-question 1</td>
<td>Who are the direct and indirect stakeholders? What are the communities of practice?</td>
</tr>
<tr>
<td>✓ Sub-question 2</td>
<td>What are their interests?</td>
</tr>
</tbody>
</table>

The output from this section, namely the interests of the communities of practice, will be used to define the values of these communities. These values will be combined with other values identified from empirical research, a prioritization and selection process will take place and finally they will be translated into design requirements. The exact mechanisms and results of this process are presented in the following section.
3.3 Stakeholders’ Values

3.3.1 Method

Now that the main stakeholders have been identified, divided into communities of practice and their interest in the VAS system was explored, we will analyze what values are at stake for designing this system. The entire concept behind the VSD methodology consists of specifically accounting for values before the design of the artifact. This tentative to use the VSD framework for embedding societal values in the design of the VAS system, and in technologies in general, comes as a response to the fact that ‘engineers do not have an institutional structure at the level of society that allows them to recognize, reflect upon and actively integrate the value-laden character of their designs’ (Pesch, 2014). By using VSD to explicitly account for societal values ex-ante, and making use of multiple empirical methods we hope to create some accountability structures and eventually an active responsibility among the engineering community in terms of what values are supported or hindered by the new technology.

But before we do this, a clear definition of the term ‘value’ needs to be settled upon. In a widely accepted sense, it refers to the economic worth of a product. However, one specific definition offered by the Oxford English Dictionary is more appropriate for our research: ‘the principles or standards of a person or society, the personal or societal judgment of what is valuable and important in life.’ We chose this definition because, as explained up to this point, VSD focuses on the social and ethical aspects of technology, not on the economic value of it.

Following this definition we further used empirical research to extract the values relevant for each community of practice, as the stakeholders were grouped in the previous section. Two main types of empirical sources were used for this purpose: for identifying the end-user values, quantitative surveys on user acceptance models were carefully selected. After a literature review, the values influencing the end-user’s willingness to adopt the technology were extracted as being relevant for this community of practice. For the other communities on the other hand, the interests extracted from the interviews with the UL TS consultants were translated into values, where appropriate. The values still needed to be defined so that we make sure they have the same meaning across different communities. For this purpose we used the table ‘Human values (with Ethical Import) often implicated in system design’ defined by (Friedman et al., 2006) as a starting point. The table can be found in Appendix B of our research paper. Nonetheless we did not limit ourselves to this list of values and definitions, because as (Friedman et al., 2006) state it does not represent the exhaustive list of relevant human values at stake in system design. It is mainly a guideline inspired by combining deontological and consequentialist moral orientations with values related to system design. We also used definitions from other authors and common sense to define the other values. An important note is the fact that in the value extraction and conceptualization process we covered both system and human (moral and non-moral) values, as (Friedman et al., 2006) did.

After having a list of relevant values per each community of practice, with the associated definitions, we identified the common values among all or as many communities as possible. But even though some values were common, they had a slightly different meaning from one community to the other as a result of the conceptualization process. We analyzed each of these common values and defined exactly what the stakeholders understand by each value, so a common terminology for these values was established. This entire mechanism which was used to prioritize and define the values to be ‘laden’ in the technology was inspired by the concept of Boundary Object from the social sciences (Star & Griesemer, 1989). While our application of the concept is not a typical one, it has increased
the strength of our research by offering a mechanism to prioritize values, make trade-off and also reach common terminology between the communities of practice.

Having decided on a list of values that we want to embed in the VAS system, the next step was to translate these values into specifications. The tool used for this purpose was the ‘value hierarchy’ as introduced by (Van De Poel, 2013). These values were specified into norms and later on design requirements.

This section proposes to answer the two sub-questions that are left from Research Question 3, related to the system stakeholders. These sub-questions are SQ3 - What are their values?, SQ4 - What prioritization mechanisms are there in place for the values? and SQ5 – How can these values be translated into design requirements?

3.3.1 End-Users Values

As mentioned earlier, the goal of this sub-section is to identify the end-user values that are at stake in a potential VAS system. While the interviews conducted with the consultants inevitably tapped into some of the end-user values, we felt like this part of our research needs more scientific support. The reason is that although the values and interest of all the stakeholders are important, the end-user values are sometimes overlooked during the design process of a technical system because this community of practice is not actively involved in the design process like other business stakeholders are. Failing to take the end-user values into account when designing a system can lead to a poor adoption, not to mention the different ethical problems raised by embedding the wrong values into a technology. A method to account more for the end-users values was needed to complement our interviews.

Fortunately, the academic body of knowledge contains an impressive amount of quantitative research which is more reliable for this purpose, namely the user acceptance studies for different technologies. Even though we are trying to identify user acceptance criteria for payment Value Added Services, because of the novelty of the topic, no such studies were found during our literature review. We thus focused the literature review on user acceptance criteria for payment technologies. We do not consider this aspect as a limitation of our research, but actually a strong point for the following reason: the entire idea behind the VAS system is to integrate it seamlessly into the current payment technologies, so the VAS system will be so closely intertwined with the payment technologies that the user will perceive these services as part of the payment process. Thus, the values extracted from user acceptance of payment technologies studies are highly relevant and should be accounted for in the VAS system design.

The literature review was conducted around the criteria ‘classification by means of technology’ for digital payments, as it was introduced in Chapter 2: Domain Background. The three main technologies for payments, namely card, mobile and online were investigated with respect to the user acceptance criteria and ethical considerations. The following data bases were used: Scopus, Science Direct, Web of Science, Google Scholar and TU Delft Repository. Keywords like: ‘payment card’, ‘smart card’, ‘credit card’, ‘online payment’, ‘electronic payment’, ‘mobile payment’, ‘NFC payment’, ‘digital payment’ were combined with terms like: ‘user acceptance criteria’, ‘technology acceptance model’, ‘ethic’, ‘human values’, ‘customer adoption’, ‘customer acceptance’, ‘acceptance determinants’ to form the search queries. The search was limited to articles from 2004 since that was the moment when the new EMV cards were adopted in the Netherlands. We considered that analyzing articles which tackled with
acceptance of the more primitive, outdated and unsecure payment technologies would not be relevant for our research purpose since the end-users concerns were different for those technologies.

Before we present the selected articles and their findings, some theoretical concepts need to be introduced regarding these user acceptance studies. **Theory of Reasoned Action (TRA)** is one of the first theories that proposed to investigate the relationship between attitudes, subjective norms and behavioral intentions (Bagozzi, Baumgartner, & Yi, 1989). **Theory of Planned Behavior (TPB)** is an improvement of the TRA model by introducing a new construct, representing the perceived ease or difficulty when performing an action (Mathieson, 1991). Built on TRA and TPA, **Technology Acceptance Model (TAM)** (Van De Wijngaert, Bouwman, & Contractor, 2014) is a more accurate model that identifies the linkages between “individual user’s attitudes and perceptions towards technology and the actual adoption of technology” (Leong, Hew, Tan, & Ooi, 2013). TAM has also been extended to TAM2 which includes subjective norms (social influence, voluntarism and image) and some cognitive concepts (like result demonstrability, experience and job relevance) (Venkatesh & Davis, 2000). Finally, an important model is the **Unified Theory of Acceptance and Use of Technology (UTAT)** which was created by (Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, Venkatesh, Morris, Davis, & Davis, 2003) by combining the previously mentioned TRA, TAM, and TPB with the **Diffusion of Innovation (DOI)** model, **social cognitive theory** and **PC utilization** model. This model also adds contextual factors. Even though the UTAT model is the most comprehensive, it was not so often used by researchers as (Leong et al., 2013) states. Instead, the TAM has been widely used to test for user acceptance in a wide range of contexts in studies related to technology/information systems (Van De Wijngaert et al., 2014). This statement is also confirmed by our literature review. Several of the studies that we found expanded TAM into the TAM2 model. To conclude with, the current literature review will focus on the TAM and TAM2 paradigm.

The conceptual models and the empirically proven hypothesis of the selected studies were carefully considered. The factors influencing the adoption that were not related to values, for example the user age, were not considered. The factors that were directly or indirectly connected to a value were further taken into account. Some factors that were not specifically formulated as values needed to be translated. Others were stated as values to begin with, in which case that value was directly extracted. Having the values extracted, a certain degree of conceptualization was needed. As mentioned in the Method section, the table ‘Human values (with Ethical Import) often implicated in system design’ defined by (Friedman et al., 2006) served as a starting point for identifying which human value would best illustrate each relevant adoption factor. This was not the only sources though, as the table does not provide an exhaustive value list. An important reminder is that we did not limit our value extraction and conceptualization process to moral values only, but also included system values or non-moral values in our research as (Friedman et al., 2006) did.

In the following we will present the actual findings of our literature review. Regarding the first type of payment technology, namely **card payments**, two papers were selected on user adoption. The first paper written by (Taherdoost & Masrom, 2009) is entitled “An examination of smart card technology acceptance using adoption model” is an article that develops an acceptance model for smart cards. They define a smart card as a ‘plastic card with an embedded microprocessor chip capable of storing a significant amount of data and performing basic computing operations’, which is exactly what the current payment card (both debit and credit) from the Dutch payment landscape actually consists of. The study proposes to develop an acceptance model for such cards based on literature review. While the acceptance model is not tested with empirical data, we still believe that the factors identified by the authors from literature review provide a valuable insight into what consumers think it is important
in smart card technologies. Table 10 below presents the factors found relevant by their research, along with their definition as it was offered by the authors based on their conceptual investigation.

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td>The degree to which an individual is aware about the technology</td>
</tr>
<tr>
<td>Support</td>
<td>The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system</td>
</tr>
<tr>
<td>Anxiety</td>
<td>The degree to which users are worried about using the technology</td>
</tr>
<tr>
<td>Ease of use</td>
<td>The degree to which a person believes that using a particular system is free of effort</td>
</tr>
<tr>
<td>Usefulness</td>
<td>The degree to which a person believes that using a particular system would enhance his or her job performance</td>
</tr>
<tr>
<td>Security</td>
<td>The degree to which a person feels that security is important to them and believes that using the smart card is secure</td>
</tr>
<tr>
<td>Compatibility</td>
<td>The degree to which the innovation is perceived to be consistent with the potential users’ existing values, previous experiences and needs</td>
</tr>
<tr>
<td>Image</td>
<td>The degree to which the use of an innovation is perceived to enhance one’s image or status in one’s social system</td>
</tr>
<tr>
<td>Social Influence</td>
<td>The degree to which an individual perceives that it is important that others believe he or she is using the new system</td>
</tr>
<tr>
<td>Triability</td>
<td>The degree to which an innovation may be experimented with before adoption</td>
</tr>
<tr>
<td>Visibility</td>
<td>The degree to which the results of an innovation are visible and communicable to others</td>
</tr>
<tr>
<td>Demographics</td>
<td>Age, gender, education, experience</td>
</tr>
</tbody>
</table>

*Table 10: Definition of factors (Taherdoost & Masrom, 2009)*
From this table, all factors can be used to extract values for the End-Users Community of Practice, except demographics which do not fall under human or system values. This conclusion was reached using the previously explained meaning of value, namely ‘the principles or standards of a person or society, the personal or societal judgment of what is valuable and important in life.’ applied to payment technologies using common sense reasoning. This definition of value is compatible with both to human and system values.

“An empirical study of customers’ perception of security and trust in e-payment systems” is the second article from the card payment category. The research conducted by (C. Kim et al., 2010) proposes and empirically tests a conceptual model for evaluating the determinants influencing customers’ perceived security and trust in electronic payment systems, as well as the effect of perceived security and trust on the actual usage of the electronic payment systems. The authors’ also classify Electronic Payment Systems in two groups, based on the participants: B2C & C2C and B2B. In the first category they include electronic cash, pre-paid card, credit card and debit card. This classification covers entirely our card payment technologies and makes the study perfect for our purpose. Their sample consisted of 219 subjects in Korea and the model was tested using structural equation modelling. As a limitation of the study the authors point out that these are not all the factors influencing the customers’ perception on security and trust, and the use of EPS. We do not perceive this as a limitation for our purpose, because the values extracted from this study will be added to the list of values extracted from the other studies in a tentative to build a list as comprehensive as possible. Figure 9 below illustrates the conceptual model developed by the authors.

![Figure 9: The model of perceived security and perceived trust in EPS use (C. Kim et al., 2010)](image)

Hypothesis H1, H2, H5, H7, H8 and H9 were empirically proven. We focus on attention on the last two hypothesis H8: Perceived security in EPS is positively associated with the consumers’ use of EPS and H9: Perceived trust is EPS is positively associated with consumers’ use of EPS. Out of these hypothesis we extract the values security and trust as being relevant for our research. While security was identified also in the previous study, trust is a newly introduced concept.

Before moving further to the next category of payments and extracting more values we need to conceptualize these two. Regarding security, the authors say that ‘Generally, security is a set of procedures, mechanisms and computer programs for authenticating the source of information and guaranteeing the process’ (C. Kim et al., 2010). We will accept this definition because it nuances more the technological system value, rather than the human value equivalent with safety like the previous study presents it. We will thus introduce security as a system value, a value of the technology. The
new concept, trust, on the other hand is not defined by the authors. Looking at the table in Appendix B, (Friedman et al., 2006) provided a definition by combining the findings from several other authors: ‘Trust refers to expectations that exist between people who can experience good will towards others, feel vulnerable, and experience betrayal.’ This is the definition we will accept and use for the concept of trust as a human value.

To conclude our analysis regarding card payment technologies adoption and acceptance, the following values were extracted and will be further used in our research: awareness, support, anxiety, ease of use, usefulness, security, compatibility, image, social influence, triability, visibility, and trust.

Moving further to the second type of payment technology, namely online payments, also three articles were selected on user adoption criteria for this technology. Before presenting their conclusions it is worth mentioning that we did not reduce our review strictly on online payments articles, but we also included articles on any type of financial transaction over the internet, regardless if the customer purchases a good or a service. This means that our review includes papers on online payments and the general ecommerce notion, since the latter involves purchasing goods and paying for them over the internet but also papers on internet banking which is a service that involves financial transactions over the Internet. So a more accurate way of describing this category of articles would be research on the online environment transactions.

The first article written by (Tsiakis & Sthephanides, 2005) is “The concept of security and trust in electronic payments” and analyzes the implication of trust and security in online payments, which the authors label as electronic payments. They provide some technical mechanisms by which trust and security can be increased in online payments, and while those mechanisms are not the core knowledge that this article adds to our research, we did use the paper to further develop the trust and security values. To define the concept of trust they turn to (Mayer, Davis, & Schoorman, 1995): their study integrates research from different disciplines and with a very thorough conceptual research it provides a definition of trust, with an emphasis of differentiating it from similar constructs. Their definition is ‘the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.’ This matches the definition we adopted, because (Friedman et al., 2006) included the study by (Mayer et al., 1995) to develop their definition. But regarding the definition of security, (Friedman et al., 2006) does not define this so we turn back to (Tsiakis & Sthephanides, 2005) which provide a list of seven security requirements and their definition, based on literature research. These requirements can be used to further enrich our value analysis: ‘identification – uniquely identification of a person or entity’, ‘authentication – providence of identity’, access control – control on the actions of a person or entity, based upon its identity’, ‘confidentiality – prevention of unauthorized parties to capture, interpret or understanding data’, integrity – insurance that data have not been altered or manipulated by unauthorized parties’, ‘non-repudiation – prevention of denying the action of participating into a transaction by a person or entity’ and ‘availability - continuously and uninterrupted provision of services’. (Tsiakis & Sthephanides, 2005)

The second article selected related to the online environment transactions is “Consumer adoption of Internet Banking” by (Song, 2010) and enriches the TAM model with concepts such as Trust, Perceived risk and Quality. A research model was developed and empirically tested on a sample of 258 respondents using structural equation model. Figure 10 below depicts the conceptual model. Out of the 16 proposed hypothesis, 14 were empirically supported. Hypothesis H9b, namely “Service quality has a positive influence on the perceived ease of use” and H10a: “System quality has a positive influence on the perceived usefulness” were the ones not supported.
The authors offer a definition of some of the variables: ‘system quality – the functionality of an internet banking website’, ‘service quality – the overall support delivered by the providers of the service’, ‘perceived usefulness – the degree to which a person believes that using a particular system will enhance his or her job performance’, ‘perceived ease of use – the degree to which a person believes that using a particular system will be free of effort’, ‘trust perception – an aggregation of believes that willingly allow a customer to become vulnerable to an internet bank’ (Song, 2010). From this list we extract the following values, with the corresponding definition offered by the authors: system quality and service quality. The rest of them are already present in our research, and our definitions match with the ones offered by (Song, 2010).

Perceived risk, attitude and behavioral intention is not defined by the authors though. For defining risk we will turn again to (Mayer et al., 1995) which, in his development of the trust framework, adopted a definition of risk from: ‘the extent to which there is uncertainty about whether potentially significant and/or disappointing outcomes of decisions will be realized.’ This is the definition we are also going to use further. Attitude towards a behavior is defined by (Y. J. Kim, Chun, & Song, 2009) as ‘an individual’s positive or negative evaluation of performing the behavior’, which is the definition of attitude we will also adopt. Finally, we do not consider behavioral intention a system or a human value, thus we will not include this in our list of relevant values.

Finally, the third article from the online transaction category is written by (Gajendra & Wang, 2014) and entitled “Ethical Perspectives on eCommerce – An empirical investigation”. The article proposes to identify the ethical factors that affect the user adoption and perception of electronic commerce systems. For the empirical part of the study the researchers conducted an online survey with users from an online virtual world platform called Second Life, which also doubles as a very active e-commerce environment because users create and purchase virtual products with their real-life money. The survey was conducted on ethical aspects influencing user’s perceptions on e-commerce in the online environment. 473 valid responses were counted by the authors. As a limitation the researchers point out that the age, ethnicity and economic background of the surveyed users is not the most diversified considering they are all members of the Second Life virtual world, which is only one of the virtual reality platforms out there. The nature of the online services is also presented as...
another limitation. Nonetheless, the findings of the authors provide us important insight. Their conceptual model is depicted in the Figure 11 below.

![Figure 11: Conceptual model for e-commerce ethics (Gajendra & Wang, 2014)](image)

All the relationships were empirically supported. Besides the trust and security concepts we notice a new concept, namely privacy which positively influences the loyalty of the customers in the digital environment. The following definition adopted by the authors will also be used in our research to conceptualize this value: ‘privacy is thus defined as protection of the collection, storage, processing, dissemination and destruction of personal information’ (Gajendra & Wang, 2014). The reasons why the authors combine this construct with the security one is because their research shows that users are afraid that their personal information might end up in the hands of hackers, or used for malicious purposes. We thus include privacy in our list of relevant human values.

To conclude our analysis regarding online environment transactions we added the following values to our existing list: identification, authentication, access control, confidentiality, integrity, non-repudiation, availability, system quality, service quality, perceived risk, attitude and privacy.

Finally, the last category of payment technologies, namely mobile payments was investigated for user acceptance criteria and the values were extracted. Even though the number of articles for user acceptance criteria in mobile payments is the highest out of the three types of payments, we only included the findings of 2 articles from this category in our research. The reason is because we only present here the findings of the research that added new factors/ values to our existing list, so we do not present the papers confirming the multitude of values that we have already chosen to use in our research. Before moving on to present their results it is worth mentioning that the focus of this part of our literature review was on NFC mobile payments, as the other two types of mobile payments (QR/Barcode and SMS mobile payments) were excluded because of the scarcity of the academic studies and because of their irrelevance in the contemporary payment context, and especially in the Dutch market, as presented in the chapter dedicated to the domain background.

The first out of the two studies is conducted by (Tan, Ooi, Chong, & Hew, 2014) analyzes survey data obtained from 156 respondents using structural equation modeling and multi-group analysis. The research analyzes the adoption factors for the mobile credit card which basically refers to the payment card virtualized on the mobile phone, namely NFC mobile payments. While the terminology used is different than ours, the study refers basically to the exact technology which is why the findings were used. The authors create the conceptual model based on TAM by adding four new constructs and analyzing also the moderating influence of gender. Their model is presented in Figure 12.
All hypothesis from this model were supported, except H5 and H6. While perceived risk was already included in our list of relevant values from a previous study where it was empirically proven, perceived financial cost is not present in our list and will not be included because H6 was not supported. Perceived usefulness, perceived ease of use and social influence are already extracted from previous studies so H1, H2 and H3 do not provide new insight for our research. On the other hand personal innovativeness will be included as a new value, since H4 is also empirically supported. Last but not least, gender is excluded as it does not constitute a human or a system value.

A new research approach is offered by (Zhou, 2014), who analyzes the factors that affect the continuance usage of mobile payments, meaning the factors relevant once the technology has been adopted. The research identifies performance expectancy, flow, trust and system quality as the factors with an empirically proven influence on the intention of the users to keep using mobile payments. The results were obtained using the structural equation modeling technique on a survey conducted on 40 mobile payment users. The author defines performance expectancy as ‘the utility derived from using mobile payments’, and flow as ‘a state that is characterized by: a seamless sequence of responses facilitated by machine interactivity, intrinsic enjoyment, a loss of self-consciousness and self-reinforcement’. The third factor, namely trust was already introduced in our list of relevant values, especially that (Zhou, 2014) uses the definition of trust provided by (Mayer et al., 1995) which we also used to conceptualize this value. System quality is also defined in a similar way with our definition so it will not be introduced. Performance expectancy and flow will be the two system values that will be extracted from this study and used further in our research.

To conclude our mobile payment adoption factors review, we have extracted the following human and system values relevant for our research: personal innovativeness, performance expectancy, and flow.
Finally, we conclude by listing again all the values extracted for the End-Users community of practice. These were identified from user adoption and acceptance studies of payment technologies (card, online and mobile): awareness, support, anxiety, ease of use, usefulness, security, compatibility, image, social influence, triability, visibility, trust, identification, authentication, access control, confidentiality, integrity, non-repudiation, availability, system quality, service quality, perceived risk, attitude, privacy, personal innovativeness, performance expectancy, and flow.

In the following sub-section we will extract the values for the other communities of practice, based on the interests identified in the interviews.

### 3.3.2 Communities' of Practice Values

To be more specific, the stakeholders’ interests as they were identified in the 3.2 section will be conceptualized into the corresponding values, following the same reasoning as above. Logical reasoning and common sense was used for extracting each value based on an interest, where this was applicable. During this process, the researcher was careful not to extract the same value for interests that have conflicting or different meanings. Other tools among which ‘Human values (with Ethical Import) often implicated in system design’ defined by (Friedman et al., 2006), which was also used in the empirical literature review earlier and can be seen in Appendix B, was used also here to check for the correctness of the extracted values.

We will begin with the first community of practice, namely End – Users. Even though in the previous sub-section we extracted values for this community based on empirical research, we will extract in this paragraph also the values based on the interests identified from the consultants interviews, for this CoP. Taking a look at Table 2: Customer - CoP and Interests from section 3.2.3, Table 11 below was developed. This new table also contains a column for the values conceptualized based on the interests.

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>End - Users</td>
<td>• Hassle-free VAS user experience</td>
<td>• Ease of use</td>
</tr>
<tr>
<td></td>
<td>• Mobile payment improvement</td>
<td>• Innovativeness</td>
</tr>
<tr>
<td></td>
<td>• VAS always available</td>
<td>• Availability</td>
</tr>
<tr>
<td></td>
<td>• Seamlessly integrated with payments</td>
<td>• Flow</td>
</tr>
<tr>
<td></td>
<td>• Integrated with both <em>brick-and-mortar</em> and <em>web-shops</em></td>
<td>• Payment instrument independence</td>
</tr>
<tr>
<td></td>
<td>• Privacy aware</td>
<td>• Privacy</td>
</tr>
<tr>
<td></td>
<td>• Secure way of storing and using VAS</td>
<td>• Security</td>
</tr>
<tr>
<td></td>
<td>• Offered as a free service</td>
<td>• Cost – free</td>
</tr>
<tr>
<td></td>
<td>• Loyalty points &gt; couponing in the Netherlands</td>
<td>• Configurable</td>
</tr>
</tbody>
</table>

Table 11: Interests and Values for End – Users

We notice that a lot of values are overlapping with the ones extracted from the empirical research, except payment instrument independence, configurable and cost – free. These will be added to the previous list of values for the End – Users Community of Practice which was extracted from empirical studies.
Moving further to the next community of practice, namely the Store Executives. As earlier, Table 12 below was created based by extracting the values from the Store Executives’ interest, as they were identified from the interviews and mapped in Table 3 from section 3.2.3.

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interests</th>
<th>Values</th>
</tr>
</thead>
</table>
| Store Executives       | • Decreasing payment friction  
                        |   • Increasing conversion rate  
                        |   • Brand recognition  
                        |   • Flexible way of joining the scheme  
                        |   • High degree of VAS offer customization  
                        |   • Infrastructure for digitizing their VAS  
                        |   • Access new customers via the system  
                        |   • Compatibility of the system with all customers and banks  
                        |   • Compatibility with existing payment infrastructure  
                        |   • Minimal integration changes  
                        |   • Security and anti-fraud mechanisms for offers  
                        |   • Customer awareness when using VAS  
                        |   • Ownership of data  
                        |   • Analytics service  
                        |   • Easy to train clerks to work with it |   • Flow  
                        |   • Profitability  
                        |   • Visibility  
                        |   • Flexibility  
                        |   • Configurable  
                        |   • Reliability  
                        |   • Reach  
                        |   • Standardization  
                        |   • Compatibility  
                        |   • Ease of integration  
                        |   • Security  
                        |   • Awareness  
                        |   • Data ownership  
                        |   • Analytics capabilities  
                        |   • Ease of use |

Table 12: Interests and Values for Store Executives

For the Sales Assistants CoP we have Table 13 below, which is based also on Table 3: Merchant - CoP and Interests from section 3.2.3 which presented their interests as extracted from the interviews.

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interests</th>
<th>Values</th>
</tr>
</thead>
</table>
| Sales Assistants       | • Easy to operate  
                        |   • Easy to fix in case of malfunction |   • Ease of use  
                        |   • Ease of debug |

Table 13: Interests and Values for Sale Assistants

The next community of practice consists of Brick-and-Mortar Acquirers & Payment Service Providers. Table 14Error! Reference source not found. below depicts the extraction of values based on each of the interests identified during the interviews for this CoP. The table was compiled from both Table 4: Acquirer - CoP and Interests and Table 7: VAS Provider - CoP and Interests since any of these two stakeholders can play the role of both Acquirer and/or VAS Provider.
### Community of Practice Interests and Values

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interests</th>
<th>Values</th>
</tr>
</thead>
</table>
| **Brick-and-Mortar Acquirers & Payment Service Providers** | • Expand business into the online world, respectively into the physical world  
• Compatibility with different payment instruments  
• Minimal changes to the existing terminals and ECRs, preferably done remotely  
• Increase revenue by having as many merchants as possible  
• Easy ECR/merchant backend integration  
• Own valuable customer data  
• Bridge the gap between the Merchant and Issuer  
• Acceptance across all issuing banks and merchants  
• Modularity for digitizing merchant offers | • Payment instrument independence  
• Compatibility  
• Flexibility  
• Ease of integration  
• Data Ownership  
• N.A.  
• Standardization  
• Configurable |

*Table 14: Interests and Values for Brick-and-Mortar Acquirers & Payment Service Providers*

Also closely related to the Acquirers CoP, there is the Terminal and ECR Vendor community of practice. Table 15 below depicts the extraction of values based on each of the interests identified during the interviews for this CoP. The table was created following *Table 4: Acquirer - CoP and Interests*

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interests</th>
<th>Values</th>
</tr>
</thead>
</table>
| **Terminal and ECR Vendors** | • Update existing ECRs preferably remotely  
• Sell as many new terminals and ECRs as possible | • Connectivity  
• Standardization |

*Table 15: Interests and Values for Terminal Vendors*

The next three communities of practice belong to the Financial Network and they are Schemes, Processors and Regulatory bodies. The value extraction from their interest is depicted below in Table 16 and the table was created based on *Table 5: Financial Network - CoP and Interests*

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Schemes</strong></td>
<td>• Standards for cooperation between Issuers and Acquirers</td>
<td>• Standardization</td>
</tr>
</tbody>
</table>

*Table 16: Interests and Values for Schemes*
<table>
<thead>
<tr>
<th>Processors</th>
<th>• Minimal changes to the existing payment infrastructure</th>
<th>• Compatibility</th>
</tr>
</thead>
</table>
| Regulatory Bodies | • Rules and standards for the VAS infrastructure  
• Protect the privacy of its citizens | • Regulated  
• Privacy |

*Table 16: Interests and Values for Financial Network CoPs*

The next CoP is one of the most important ones for our research, namely the Retail Banks. Table 17 illustrates the values extracted from the interests depicted in

*Table 6: Issuer - CoP and Interests.*

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
</table>
| Retail Banks | • Offer hassle - free digital service to keep up with payment institutions  
• Seamless integration with the payment process for a better customer experience  
• Security against hackers  
• Protect the privacy of their customers  
• Maintain the trust of their customers  
• Give customers possibility to configure the services  
• Offer the services for online, mobile and card payments  
• Standardized system to attract many merchants  
• Minimal changes to the existing payment infrastructure | • Ease of use  
• Security  
• Privacy  
• Trust  
• Configurable  
• Payment instrument independence  
• Standardization  
• Compatibility |

*Table 17: Interests and Values for Retail Banks CoP*

Besides banks, in the Issuer role we also have the Payment Institutions CoP. Their values are shown in the Table 18 below, also based on

*Table 6: Issuer - CoP and Interests.*

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
</table>
| Payment Institutions | • World-wide standardization  
• Build over the existing payment infrastructure | • Standardization  
• Compatibility |

*Table 18: Interests and Values for Payment Institutions CoP*
The next community of practice is one that can fulfill the VAS Provider role, as defined in section 3.2.3. These are: Specialized Software Companies. The value extraction from their interest can be seen below in Table 19.

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
</table>
| Specialized Software Companies | • Acceptance across all issuing banks and merchants  
• Configurable for digitizing various merchant offers  
• Attract new merchants as customers  
• Seamless integration into the merchant’s ECR/ backend | • Standardization  
• Configurable  
• Flexibility  
• Ease of integration |

Table 19: Interests and Values for Specialized Software Companies CoP

As mentioned in earlier sections, Brick-and-Mortar Acquirers and Payment Service Providers can also fulfill the VAS Provider role, but their values were already extracted in Table 14: Interests and Values for Brick-and-Mortar Acquirers & Payment Service Providers, even for the case when they play the VAS Provider role.

Finally, the last community of practice from the Payment Industry is represented by the payment consultants, with stakeholders like the company where the current research was conducted. Their interests are conceptualized into values in the Table 20 below, based on Table 8: Mediator - CoP and Interests

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
</table>
| Payment Consultants   | • Secure system                                         | • Security     
• System is accepted  | • Acceptability                                         
• Standardized        | • Standardization                                       
• Test the system     | • Testable                                               
• Measure compliance  | • Compliant                                              |

Table 20: Values and Interests for Payment Consultants CoP

Moving on to the communities of practice outside the payment industry, we have similarly extracted the values from their interests identified during interviews in Table 9: Other Stakeholders - CoP and Interests. The results are shown in Table 21Table 12 below.
At this point we have extracted all the values from each community of practice as they resulted from the interests of the stakeholders identified in the interviews. The following section will combine all these values with the ones extracted from empirical research and offer a mechanism for selecting which values will be supported and which values will not be supported by the new system. 47 values are presented in the tables above, covering 15 communities of practice. The overview of all values extracted for each community of practice can be found in Appendix C: Communities of Practice and their values.

### 3.3.3 Boundary Object

As shown in the section above, each community has a different perception on what functions should the VAS system have, and thus a different view on what values it should support. This is quite normal in the development of technical systems and during requirement elicitation processes since every stakeholder has different interests and uses of the system. Since 47 values were extracted, from a total of 15 communities of practice, there are still two questions to be answered. The first one is which of these values should be the ones considered for the system design? Answering this is one of the major challenges of the VSD methodology. The problem comes from the lack of a proper value prioritization mechanism in VSD. The second question and major challenge in VSD is how shall conflicting values be handled? This comes from the lack of trade-off mechanisms in VSD (Manders-Huits, 2011). The current research tries to address these two issues by incorporating a concept from social sciences, namely Boundary Object.

The Boundary Object, developed by (Star & Griesemer, 1989), is a model which was first created for clarifying stakeholder interests and terminology in a Natural History Museum research. Because, as it is the case for the VAS system, for the museum project the different communities of practice interpreted certain subjects in different ways. A common understanding between these communities needed to be established, thus the Boundary Object concept was born. Quoting (Fritsch, 2007) we present the definition of the concept:

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Interest</th>
<th>Value</th>
</tr>
</thead>
</table>
| **Software Developers** | • Opened for development  
• APIs and SDKs  
• Secure platform  
• Supported on multiple OS platforms | • Openness  
• Programmable  
• Security  
• Payment instrument independence |
| **MNOs** | • Identify customers for merchant  
• Charge as many internet network services as possible | • N.A.  
• Connectivity |
| **OEMs** | • Compatibility with the existing phone technologies (NFC, BLE, etc.) | • Compatibility |

*Table 21: Values and Interests for Other Stakeholder CoPs*
"...those objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use and become strongly structured in individual-site use. These objects may be abstract or concrete... Such objects have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting communities."

In our research, the technical architecture of the VAS system takes the form of the Boundary Object. This architecture has to be flexible enough to allow the communities of practice to communicate during development and to introduce as many of their own values as possible, yet has to have a design which is robust enough to maintain a common identity across these communities. The Boundary Object should incorporate the common knowledge across the communities. There is one particularity about how the concept is used in the current research though: while the original application of the Boundary Object proposes to identify and understand common “knowledge” and “terminologies” across the communities (Star & Griesemer, 1989), we are specifically interested in the common “values” and their meaning, not on any other knowledge.

So a first step in constructing our Boundary Object was to find the common values. We did this by intersecting all the 47 values that were previously extracted from the 15 communities of practice. There were no values that were present among every single community, so we decided to select the values that are present in at least three communities. Following this mechanism, 10 values were selected: Standardization (present in 9 CoP), Compatibility (7 CoP), Security (5 CoP), Configurable (5 CoP), Ease of use (4 CoP), Payment instrument independence (4 CoP), Privacy (3 CoP), Flow (3 CoP), Flexibility (3 CoP) and Ease of integration (3 CoP). The exact data with the name of the communities and the recurrence of the all the values is show in Figure 13: Top values in CoPs on the following page.

But while some values may have a common name, these stakeholders from the different social worlds might have a different understanding for them. Which is why in the next step we will detail on each value by explaining each community’s understanding of it. The explanations are based on the content from the two previous sections, 3.3.1 End-Users Values and 3.3.2 Communities’ of Practice Values.
Figure 13: Top values in CoPs
Standardization

A value supported by 9 CoPs, it is first present in the Store Executives CoP. Their understanding for this system value is reflected on a store level. Before making this investment they want to insure that all their customers will benefit from it, so they will only adopt the system in their store when a dominant standard surfaces. Installing multiple systems in order to cover all customers would be too costly. The next CoPs where this value is present, are the two communities offering acquiring services to the previously mentioned community. These are Brick-and-Mortar Acquirers & Payment Service Providers. Their understanding of the value is similar, but extended on a national market not only store level. While it is very costly to support multiple standards in one store, but since they have multiple stores as customers, this problem will become orders of magnitude bigger if a dominant standard does not surface. The same reasoning goes for the other CoP on the acquiring side, the Terminal and ECR Vendors, since they work in close collaboration with the acquirers. Also on a national market level, standardization is wanted by the communities on the issuing side, namely Retail Banks for the same reasoning. They want to offer value added services which can be used by their customers anywhere, and the only way to do that is by having a dominant standard since developing, releasing and supporting multiple systems simultaneously is not feasible. Closely related to this view is the view of the Specialized Software Companies which will work closely with the issuers in creating and managing this VAS System. Schemes on the other hand want standardization on a global or at least European level. An example in this sense is the Payment Account Reference (PAR) identifier which EMVco wants to introduce as a standard in their smart-cards. The identifier will enable merchants and acquirers to consistently link transactions initiated with payment tokens to identify a Primary Account Number (PAN) even after the account number has been tokenized. The applications of PAR, if adopted, will include Anti-Money Laundering (AML), risk based services and merchant loyalty programs, the latter one being one type VAS proposed by the current research. Their initiative does not offer the solution unfortunately, since the PAR might or might not become a reality in the near future. Payment Institutions and OEMs also want a more global standardization for the VAS because it is quite difficult for these Silicon Valley players to implement a personalized VAS offering for every payment standard present in every country. Finally the Payment Consultants CoP want national level standardization, since the customers that they are bringing together are targeting the market in the Netherlands.

Compatibility

This is a value present in 7 communities. The End-Users perceive compatibility as the ‘degree to which the innovation is consistent with the potential users’ existing values, previous experiences and needs’ according to (Taherdoost & Masrom, 2009). The Store Executives CoP on the other hand perceive it from a more technical point of view, as compatibility with the current payment infrastructure to be more precise. So do other communities like Brick-and-Mortar Acquirers & Payment Service Providers, and Processors. Their reasoning is based on costs associated with testing and recertifying the elements on the payment infrastructure because of some new potential messages that the VAS system might introduce on the payment communication channel. Retail Banks and Payment Institution also understand the same technical compatibility with the payment infrastructure by this value, but their motivation for considering it important is different: while they are not directly impacted by the costs of updating, they are aware that this cost has to be supported by the merchants, acquirers and processor, which means that these 2 issuing CoP see these costs as a barrier for the roll-out of the system. OEMs are also interested in compatibility but from a different perspective: their understanding of the value is compatibility with the smartphones they produce, and the technologies that these smartphones contain: NFC, BLE, QR/barcode etc.
Security

Security is a value supported by 5 communities. The first one is End-Users, and their security concern is related to how safe the coupons, loyalty points, receipts etc. are stored. They do not want to lose their rewards or to be exposed to attacks by malicious parties. The concern increases even more if these rewards are stored in any environment related to their payment or banking data, since this would imply that their payment data is vulnerable. Store executives on the other had understand by security the safety of the VAS database: they do not want hackers to be able to virtualize and use “fake” rewards. Retail banks also have an interest in this value, but also from a different angle as the previously mentioned 2 CoPs: opening up APIs for providing identification to VAS Providers creates vulnerability, so they are concerned with the potential security breaches in their backend system which the system would create. They are not so much concerned with the safety of the user’s rewards or the ability to create fake rewards. Software Developers understand by security a secure development platform, on which to create apps. Any kind of malicious attack on the VAS system could reflect badly on their plug-ins, apps or widgets, since the general public cannot differentiate between a breach in the system infrastructure and a breach in the app. Finally, Payment Consultants are interested in all the previously mentioned sides of the system security because they are the one testing, auditing or even certifying the system.

Configurable

Present across 5 CoPs, this value has two different meanings among these 5 social worlds. The first understanding supported by the End-Users and Retail Banks is related to the degree to which these end-users, which are the retail banks’ customers, can customize the kind of offer they want to receive, the time and amount of offers they want to use and the general services offered by the system. The reason is obvious, having a high degree of customization increases the value of the system and offers another incentive for adoption. The second understanding of the configurable value is one shared by Store Executives, their Brick-and-Mortar Acquirers & Payment Services Providers and the Specialized Software companies digitizing the value added services. Their view on this value relates to the degree to which merchants have the freedom to configure what kind of VAS they want to offer: for what product/ amount, what type of reward and how this should be redeemed, how easy it is to change this rewarding system and so on. They also want a high degree of customization and this request will shape the technical architecture in a certain way.

Payment instrument independence

The next important system value is payment instrument independence which is important for 4 CoP. The value is straight-forward and similarly understood in all communities. End-users want to benefit from VAS regardless of the payment means that they have at their convenience. Retail Banks have the same incentive to push for payment instrument independence, because they want to offer VAS to all of their customers regardless of the environment in which they shop. Store executives have a similar understanding of the value because this will increase the coverage of the system among their customers. Brick-and-Mortar Acquirers & Payment Service Providers are interested in expanding their business into the online world respectively into the physical stores, so they want to support both shopping environments which means that the VAS system has to be compatible with both.
Ease of use

As the name of this value suggests, it represents the intuitiveness that characterizes the system use and it is important for four CoPs. This value is also two-folder because the End-Users and Retail Banks refer to the easiness of using the system on the user side: for collecting and spending rewards. But Store Executives and Sales Assistants understand by this value the ease of use for the store employees, in transferring and applying the rewards, computing new prices and so on.

Privacy

A value which gains more and more importance in designing high-tech systems nowadays, privacy is a big concern for 3 CoPs in our research: End-Users, Retail Banks and Regulatory Bodies (the Dutch Government to be more specific). Their understanding of the privacy is common: they want a system which protects the end user from being profiled based on his shopping behavior, but also blocks other parties from retrieving sensitive user data. Privacy is highly connected with another human value present in our analysis, namely Trust. If the users’ privacy is not respected, their trust in the retail banks offering the value added services will decrease.

Flow

For this value there are also two different understandings. End-users and Retail Banks are interested in a seamless integration of the system with the payment process, making the entire shopping experience a smooth process. Store Executives on the other hand understand by flow reducing the payment friction and increasing the conversion rate during the check-out process. To be more specific, this CoP wants a smoother process for when the users is at the cash register (so that they can reduce the check-out time spent per customer, which translates in cost savings for the CoP) and a simpler process of check-out in the online environment (so that customers do not give up along the way, which translates in decreasing revenues for the CoP). The two understandings are somehow connected, because having a VAS system which is seamlessly integrated with the payment process will reduce the checkout times both in brick-and-mortar and online shops.

Flexibility

A value which has a common meaning across all three communities in which it is present: the degree to which the VAS system allows new merchants to join or leave. The nuances of this value though are different across the communities. Brick-and-Mortar Acquirers & Payment Service Providers and Specialized Software Companies want a high degree of flexibility so that they could attract and offer VAS to as many customer stores as possible, regardless if they are big or small merchants. In a certain way they see flexibility in a scalability sense. Store executives on the other hand see flexibility as the freedom to join or leave the scheme dynamically without the hassle of predefined contracts and agreements.

Ease of integration

Finally, the last value, ease of integration is present in the same three CoPs, and it has the same meaning across all of them: easy integration with the merchant’s ECRs and backend systems. The
reason for wanting a VAS system easy to deploy into the merchant store is because this translates into
cost reduction for these parties.

### 3.3.4 Value Hierarchy

We now have a list of 10 values which should be introduced in the VAS system design. The next step
is to incorporate somehow these values into the actual system design. (Van De Poel, 2013) points out
that translating value into design specifications is a relatively neglected aspect of VSD, since VSD does
not offer tools or methods to do so. To overcome this limitation he introduces the concept of Value
Hierarchy. The model proposes to elaborate values into design requirements via an intermediate layer
of norms. From the highest layer of values, each value is detailed as one or more norms, and each
norm is further developed into design requirements. End-norms are especially important and often
used when specifying values. These end-norms can include objectives without a specific target (like
maximize confidentiality) or goals which are concrete (the payment confirmation shall arrive within
no more than 5 seconds). Constraints are also present among end-norms. (Van De Poel, 2013)

The pyramidal model is exemplified in Figure 14 below. The picture presents the specification process
of the *animal welfare* value present in the design of the Chicken Husbandry Systems (Van De Poel,
2013).

![Figure 14: The specification of animal welfare in EU Council Directive 88/116/EEC (Van De Poel, 2013)](image)

Translating the values into norms and later design requirements is not a logically deductive process.
Each lower layer cannot be deducted from the ones above, since they are more and more concrete.
The process is called by (Van De Poel, 2013) *Specification*, and there is a high degree of subjectivity
to it. Subsequently, since more than one way of specifying is possible, we acknowledge this as a limitation
of our research: the boundary object that constitutes the technical architecture will indeed include
the most important values for the stakeholders, but cannot be objectively assessed as the “best”
design which supports those values. This come from the degree of context and domain knowledge
needed for the specification process, and from the differences in the judgment of different designers.
For this reason we will not go to the very bottom of the pyramid by specifying the last layer, design
requirements. The parties responsible for implementing the system should be concerned with the low
level and specific implementation details. We will however specify the values into end-norms, based
on which the parties implementing the system will define their functional requirements. These end-
norms that we develop provide a sufficiently strong road-map which ensures that the selected
important values will be respected, while giving each individual party a certain degree of freedom regarding the implementation details.

(Van De Poel, 2013) defines two criteria for translating values into norms. The first one is that the norm should be an appropriate response to the value, so its purpose is to ensure that inappropriate norms will not be introduced. The second is that the norm engages sufficiently with the value, and its purpose is to ensure that norms represents the value sufficiently. Taking the list of values from the previous section, the following norms were developed.

Standardization:

1. The system shall be implementable following the same technical architecture in all the retail banks from the Netherlands which want to offer their customers VAS.
2. The system shall be implementable following the same technical architecture in all the stores from the Netherlands which want to offer their customers VAS.

Compatibility

1. The system shall be compatible with all the existing smartphones on the market.
2. The system shall not require changes on the terminal level
3. The system shall not require changes on the payment infrastructure level

Security

1. The system shall not allow unauthorized access to the user’s VAS account
2. The system shall not allow unauthorized access to the store’s database
3. The system shall not allow the use of fake VAS
4. The system shall not allow unauthorized access to the bank’s database

Configurable

1. The system shall allow the user to specifically select which stores he wants to get VAS from
2. The system shall allow the user to personalize the way he uses his VAS
3. The system shall allow merchants at any time to personalize their VAS offering

Payment instrument independence

1. The collected VAS shall be usable with card payments
2. The collected VAS shall be usable with online payments
3. The collected VAS shall be usable with mobile payments

Ease of use

1. Collecting and using VAS shall be simple and intuitive
2. Applying VAS by the clerks shall be simple and intuitive

Privacy

1. The system shall not disclose the identity of the end-user towards any party, other than his/her retail bank which offers the services.
2. The system shall not disclose any payment information other than the ones that are already known by the stakeholders in the payment chain
3. The system shall transparently present to the user all the information and to whom will be disclosed, if he chooses to use the VAS.

Flow

1. The collecting of VAS shall be seamlessly integrated in the payment process, requiring no extra action on the user’s side
2. The system shall allow the user to select and configure what VAS to use before he reaches the cash register, minimizing the check-out time.

Flexibility

1. The system shall allow any number of merchants to join
2. The system shall allow both large and small merchants to join
3. Merchants shall be able to join and leave the system at any time

Ease of integration

1. The system shall be compatible with the current software running on the merchant ECR
2. The system shall be compatible with the merchant’s backend system

Finally the last three sub-questions of RQ3: What is the stakeholder map for the system have been answered.

<table>
<thead>
<tr>
<th>Research Question 3</th>
<th>What is the stakeholder map?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Sub-question 3</td>
<td>What are their values?</td>
</tr>
<tr>
<td>✓ Sub-question 4</td>
<td>What prioritization mechanisms are there in place for the values?</td>
</tr>
<tr>
<td>✓ Sub-question 5</td>
<td>How can these values be translated into design requirements?</td>
</tr>
</tbody>
</table>

With the two sections: 3.2 Stakeholders’ Roles, Interests and Communities of Practice and 3.3 Stakeholders’ Values we have answered RQ3 entirely: What is the stakeholder map?
Taking a look at Figure 15 we can visualize the overall progress of our research.

**Main Research Question**

*How can Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach?*

---

**RQ1 – Chapter 1**

- What is the problem to be solved?
  - SQ1: practical problem
  - SQ2: scientific problem

**RQ2 – Chapter 2**

- What are the relevant payment and VAS technologies?
  - SQ1: digital payment instruments
  - SQ2: value added services

**RQ3 – Chapter 3**

- What is the stakeholder map?
  - SQ1: direct & indirect stakeholders
  - SQ2: stakeholders’ interests
  - SQ3: stakeholders’ values
  - SQ4: prioritization
  - SQ5: design requirements

**RQ4 – Chapter 4**

- What is the best technical implementation for the VAS system?
  - SQ1: technical alternatives
  - SQ2: value support
  - SQ3: detailed design

**Research Objective**

*Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values*

*Figure 15: Research flow*

The next chapter contains the technical investigations that VSD suggests along with the conceptual and empirical ones. The output of this chapter, namely the end-norms that the system should comply with will be further used to funnel among the technical alternatives available to implement the system. Each technical alternative will be analyzed through the lenses of these norms, and the
alternative supporting most/all norms will be chosen for further developing the system design which complies with the stakeholders’ values and interests.
Chapter 4: Technical Map
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4.1 Relevance

Technology may come in different shapes and forms, especially in the payment industry where lines between different types of payments are becoming more and more blurry: online payments are making their way in the brick-and-mortar shop via the mobile devices, while the POS is suffering great changes introducing new standards like the contactless NFC payments, which can be used both with NFC-enabled smart-cards and NFC-enabled mobile phones. On a technical level there is a constant battle between IT companies, banks and other service providers. Each of them is innovating at a rapid pace, trying to introduce a new standard that will improve the customer experience and bring it to the next level.

The dynamic technological pace is felt on every level of the payment value chain. Some players have made attempts to innovate and revolutionize also the value-added services that constitute the central topic of our research. None of the existing attempts though are sufficiently supportive of the human and system values which we selected during our research. This might explain also why there is no dominant standard for VAS, in the Netherlands or anywhere else in the world: because none of the current VAS implementations support the important stakeholders’ values.

The first part of the current chapter proposes to identify and present the different implementation alternatives for VAS along with their complementary technologies. We will not limit our alternative selection to the exiting commercial implementations, but also present some technical solutions which are not yet implemented on a commercial scale. As research methods for finding these technical alternatives, a process of funneling was applied after a thorough desk research. The desk research was done on projects that were similar or even remotely connected to the VAS system from the UL TS project repository. For confidentiality reasons, those projects will not be listed in the current research, only the output of our process, namely the 4 technical implementation alternatives. Each of the alternatives will be mapped against the norms and values extracted in the previous chapter. There are some technical alternatives which are excluded from our analysis because they are very similar or even a mixture between some of these 4 alternatives.

The second part of the chapter will offer the new system architecture. This might come from one of the 4 alternatives, or as a combination of the different strong points from several alternatives, in such a way that the new system supports the most norms. The architecture will be further enriched by also looking at the other relevant values, not only the 10 most important ones which were specified into norms. After this, Constructive Technology Assessment was employed in order to develop the chosen alternative into usage scenarios. CTA was conducted under the form of a scenario workshop with the consultants from the advisory division of UL TS.

The current chapter proposes to answer the last research question, namely RQ4: **What is the best technical implementation for the VAS system?** With the associated sub-questions: SQ1 - **What are the technical alternatives for implementing the VAS system?** SQ2 - **How does each technical alternative support/ hinder the values previously prioritized?**, and SQ3 - **What is the detailed technical architecture and the usage scenarios for the chosen alternative?**

4.2 Technical alternatives

This section will present the 4 technical alternatives selected after a thorough desk research on the UL TS project repository. All projects, on a national and global level, involving VAS, mobile payments,
digital and online wallet were carefully considered and their findings carefully balanced. Besides these, knowledge from specialized trainings on mCommerce, card payments, EMV and PSD2 was used. Some data from the semi-structured interviews was also used to guide the technical research process, since conceptual, empirical and technical investigations are closely intertwined and follow an iterative process in the VSD methodology.

Our selection process narrowed down the technical alternatives for implementing a VAS system to the following 4: MasterCard’s PayPass 3.0, Barcode technology, NFC technology and bank. As already mentioned, besides these 4 alternatives, there are similar options (for example with GSMA’s Mobile Connect for providing identity instead of bank ID), or different flavors of implementation obtained from mixing two or more of these alternatives. We have chosen not to present these hybrids and similar options since the strengths and weaknesses of each individual alternative can be better assessed from these “pure” scenarios. Each of the 4 alternatives will be presented and individually assessed against the norms specified for the 10 relevant values. We define three relations a technical implementation can have with a norm: it can support the norm, partially support it, or offer no support. Although we do show which norms are supported and which are not, the following sub-sections will not offer details on why each norm is supported by the technology, but it will provide explanations for the norms that are not supported, or the ones that are partially supported.

4.2.1 MasterCard PayPass 3.0 - M/Chip Advance

MasterCard supports a series of non-payment applications, among which also VAS, with the Integrated Data Storage functionality from their M/Chip Advance smart card application. Data like transit, event tickets, targeted loyalty promotions (via other channels), relationship rewards (specific vouchers), merchant coalitions, loyalty points and others can be stored in physical chip of the payment card and when the user is rewarded these data fields are updated.

The first problem is with the standardization, since this is supported only with cards from MasterCard, which have the M/Chip Advance applet. This makes it a bit difficult to have the system implemented the same in all banks and stores. Nonetheless, the Netherlands is mostly a MasterCard country, which is why we concluded that the two norms from this value are partially supported. Next, not all terminals support the MasterCard PayPass 3.0, which means that terminals require a software update and maybe even an acquirer infrastructure update, depending on which route the rewards follow. Also from the compatibility perspective, but on the end-user side, the technology is not compatible with all the smartphones, only with the ones having NFC communication should the M/Chip Advance applet be installed on the Secure Element for NFC mobile payments. The technology is also not payment instrument dependent, in the sense that the VAS are stored locally on card and the collected rewards cannot be used online or with mobile. Regarding configurability, this technology makes it quite difficult to select and personalize your rewarding system, both from the end-user and merchant perspective since the data is hardcoded on the chip and the rewards are established via contractual agreement between the issuing bank and merchant. The flow might also be hindered when redeeming VAS, since the end-user will have to state at the cash register to the clerk which VAS he/she wants to use. Also from the flexibility point of view, it is quite difficult for the merchants to join the scheme and the integration with their ECRs is a more complex process. From the privacy perspective, the technology is not the most transparent and protective option, since merchants could profile their customer depending on the implementation. (Giesecke & Devrient, 2013) From the 27 norms, 11 are not supported and 4 are partially supported as it can be seen in Table 22 below.
<table>
<thead>
<tr>
<th>Value</th>
<th>Norm</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standardization</strong></td>
<td>1. The system shall be implementable following the same technical architecture in all the retail banks from the Netherlands which want to offer their customers VAS.</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>2. The system shall be implementable following the same technical architecture in all the stores from the Netherlands which want to offer their customers VAS.</td>
<td>Partial</td>
</tr>
<tr>
<td><strong>Compatibility</strong></td>
<td>1. The system shall be compatible with all the existing smartphones on the market.</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not require changes on the terminal level</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>3. The system shall not require changes on the payment infrastructure level</td>
<td>No</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>1. The system shall not allow unauthorized access to the user’s VAS account</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not allow unauthorized access to the store’s database</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>3. The system shall not allow the use of fake VAS</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>4. The system shall not allow unauthorized access to the bank’s database</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Configurable</strong></td>
<td>1. The system shall allow the user to specifically select which stores he wants to get VAS from</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2. The system shall allow the user to personalize the way he uses his VAS</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>3. The system shall allow merchants at any time to personalize their VAS offering</td>
<td>No</td>
</tr>
<tr>
<td><strong>Payment instrument indep</strong></td>
<td>1. The collected VAS shall be usable with card payments</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The collected VAS shall be usable with online payments</td>
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<tr>
<td></td>
<td>3. The collected VAS shall be usable with mobile payments</td>
<td>No</td>
</tr>
<tr>
<td><strong>Ease of use</strong></td>
<td>1. Collecting and using VAS shall be simple and intuitive</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. Applying VAS by the clerks shall be simple and intuitive</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Privacy</strong></td>
<td>1. The system shall not disclose the identity of the end-user towards any party, other than his/her retail bank which offers the services.</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not disclose any payment information other than the ones that are already known by the stakeholders in the payment chain</td>
<td>Yes</td>
</tr>
</tbody>
</table>
3. The system shall transparently present to the user all the information and to whom will be disclosed, if he chooses to use the VAS.

### Flow

1. The collecting of VAS shall be seamlessly integrated in the payment process, requiring no extra action on the user’s side
   - Yes

2. The system shall allow the user to select and configure what VAS to use before he reaches the cash register, minimizing the check-out time.
   - No

### Flexibility

1. The system shall allow any number of merchants to join
   - Yes

2. The system shall allow both large and small merchants to join
   - Yes

3. Merchants shall be able to join and leave the system at any time
   - No

### Ease of Integration

1. The system shall be compatible with the current software running on the merchant ECR
   - No

2. The system shall be compatible with the merchant’s current backend system
   - Yes

Table 22: MasterCard PayPass 3.0 - M/Chip Advance Values and Norms support

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### 4.2.2 Barcode Technology

The next option for implementing a VAS system is by using barcodes. The Rabowallet has implemented some VAS using this technology. The idea behind it is that on your smartphone you have an app where you can take pictures of your membership cards, coupons, vouchers and gift cards. Then, you present the barcode of the VAS you want to use at the cash register where the clerk scans it from your phone screen and the associated discount is applied. The app can be a standalone one, or can be the NFC payment app like it is the case for the Rabowallet, making it at least conceptually connected to the payment process.

The main problem of this VAS implementation is the degree of configurability of rewards, both for merchant and customer: the technology does not offer loyalty points’ support or any other kind of cumulative rewarding system. It basically only moves the membership cards coupons, vouchers, gift cards from your wallet to your phone. This makes it very difficult to configure also by the merchant, since it first has to print out new rewards in a paper form, which the user then has to photograph in order to input them into the app. Which brings us to the second problem regarding the flow: collecting rewards by always having to photograph them makes it a very cumbersome process for the user and decreases the flow. Not to mention that the process is not seamlessly integrated into the payment process. Finally, this implementation option is highly dependent on the smartphone for both collecting and using the rewards: the pictures are stored locally in the phone and cannot be accessed from the web or in a physical store should the user decide to leave his phone at home. Last but not least, the privacy of the end-user is not protected since the merchant could profile him based on the barcode that it offers for membership programs. Security of the user’s rewards are also one point of discussion:
since they are stored locally in the app, and not on a secure chip, the degree of vulnerability is higher if other security compensatory mechanisms are not implemented. From the 27 norms, 6 are not supported and 2 are partially supported as it can be seen in Table 23 below.

<table>
<thead>
<tr>
<th>Value</th>
<th>Norm</th>
<th>Support</th>
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<tbody>
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<td>Yes</td>
</tr>
<tr>
<td><strong>Compatibility</strong></td>
<td>1. The system shall be compatible with all the existing smartphones on the market.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not require changes on the terminal level</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>3. The system shall not require changes on the payment infrastructure level</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>1. The system shall not allow unauthorized access to the user’s VAS account</td>
<td>Partial</td>
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<td></td>
<td>2. The system shall not allow unauthorized access to the store’s database</td>
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<td></td>
<td>3. The system shall not allow the use of fake VAS</td>
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<td></td>
<td>4. The system shall not allow unauthorized access to the bank’s database</td>
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<td><strong>Configurable</strong></td>
<td>1. The system shall allow the user to specifically select which stores he wants to get VAS from</td>
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<td>1. The collected VAS shall be usable with card payments</td>
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</tbody>
</table>
Table 23: Barcode Technology Values and Norms support

### Privacy
1. The system shall not disclose the identity of the end-user towards any party, other than his/her retail bank which offers the services. | No
2. The system shall not disclose any payment information other than the ones that are already known by the stakeholders in the payment chain | Yes
3. The system shall transparently present to the user all the information and to whom will be disclosed, if he chooses to use the VAS. | Partial

### Flow
1. The collecting of VAS shall be seamlessly integrated in the payment process, requiring no extra action on the user’s side | No
2. The system shall allow the user to select and configure what VAS to use before he reaches the cash register, minimizing the check-out time. | Yes

### Flexibility
1. The system shall allow any number of merchants to join | Yes
2. The system shall allow both large and small merchants to join | Yes
3. Merchants shall be able to join and leave the system at any time | Yes

### Ease of integration
1. The system shall be compatible with the current software running on the merchant ECR | Yes
2. The system shall be compatible with the merchant’s current backend system | Yes

#### 4.2.3 NFC Technology

The third alternative for implementing VAS is the one adopted by Android Pay, a solution acquired from the company previously known as Softcard. The idea is to send the VAS from the VAS Provider via the NFC payment terminal, and to store the VAS locally on the user’s smartphone.

The first problems arise on the compatibility level, since not all smartphones on the market are equipped with NFC communication. Secondly, the technology requires updating all the terminals from the merchants that want to support this, as with MasterCard’s M/Chip Advance. The payment infrastructure route might also be affected by the changes depending on the route chosen for sending the rewards. As with the barcode-based wallets, the rewards are stored locally on the user’s smartphone, but not in a secure chip which means that the degree of vulnerability is higher if extra security mechanisms are not implemented. Storing the VAS locally creates the same kind of problems as the previous solution had with payment instrument independence: the rewards cannot be used while shopping online or with a card, since they are stored only on the smartphone. Regarding privacy, this alternative is also more prone to customer profiling since the merchant can identify the customer.
based on his/her appID. The flow is also hindered, because the user has to tap one for payment, and once for rewards which have to be two sequential steps, since they are both conducted from the device, i.e. smartphone. A last problem is with the ease of integration since the merchant’s ECR has to be updated and possible the backend systems, depending on how the rewarding is done. From the 27 norms, 8 are not supported and 5 are partially supported as it can be seen in Table 24 below.

<table>
<thead>
<tr>
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<tbody>
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</tr>
<tr>
<td></td>
<td>2. Applying VAS by the clerks shall be simple and intuitive</td>
<td>Yes</td>
</tr>
<tr>
<td>Privacy</td>
<td>1. The system shall not disclose the identity of the end-user towards any party, other than his/her retail bank which offers the services.</td>
<td>No</td>
</tr>
</tbody>
</table>

99
2. The system shall not disclose any payment information other than the ones that are already known by the stakeholders in the payment chain | Yes |

3. The system shall transparently present to the user all the information and to whom will be disclosed, if he chooses to use the VAS. | Partial |

| Flow | 1. The collecting of VAS shall be seamlessly integrated in the payment process, requiring no extra action on the user’s side | No |
| | 2. The system shall allow the user to select and configure what VAS to use before he reaches the cash register, minimizing the check-out time. | No |

| Flexibility | 1. The system shall allow any number of merchants to join | Yes |
| | 2. The system shall allow both large and small merchants to join | Yes |
| | 3. Merchants shall be able to join and leave the system at any time | Partial |

| Ease of integration | 1. The system shall be compatible with the current software running on the merchant ECR | No |
| | 2. The system shall be compatible with the merchant’s current backend system | Partial |

Table 24: NFC Technology Values and Norms support

4.2.4 Bank ID

As opposed to the previous three solutions which were all local storage solutions (the VAS were stored locally on the payment instrument) the next technical implementation alternative proposes a back-end solution: the VAS and rewards for each user shall be stored on a server managed by the VAS Provider, which also manages how the users shall be rewarded based on the configurations and indications given by each merchant via an online portal.

The biggest problem with this technical alternative is represented by the integration with the merchant’s ECRs and Backend. As opposed to the barcode solution for example, heavy integration efforts need to be made either on ECR or on backend level depending on the chosen implementation. Still this disadvantage is outweighed by the fact that no terminal or payment infrastructure changes need to be made, since the VAS are collected and used OTI (over-the-internet). In this technical implementation the bank provides a means of identifying the customer for the VAS Provider, but in such a way that the customer’s privacy is protected. This can be realized using pseudo-IDs, which means that the bank creates for one customer different IDs for each merchant. The direct implication for this is that the merchants couldn’t profile one customer entirely, since each merchant has a different identification number for that customer. A second major disadvantage beside difficulty of integration is on the flexibility level: that the system does not easily allow small merchants to join as easy as large merchants can. The reason is because the small merchants have an integrated POS, which
means that they do not usually have an ECR/ backend system which is necessary to create the integration with the VAS Provider’s servers which store the VAS. These difficulties also reflect on the standardization level: standardizing this kind of communication channel on a national level might constitute a challenge. Also, banks have to be careful when opening up APIs because this translates into vulnerability if the security layers are not handled properly. Another vulnerability is related to the user’s rewards accounts: considering that this information is delivered via a non-secure channel, hackers might intercept and fiddle with this data. Finally, using VAS from an account might decrease the flow at the cash register, if the user does not use the system in conjunction with smartphone in order to select what rewards he/she wants to use before reaching to the cash register, instead of being asked by the sales assistant there. Out of the 27 norms, 3 are not supported and 5 are partially supported, as it can be seen in Table 25 below.

<table>
<thead>
<tr>
<th>Value</th>
<th>Norm</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standardization</strong></td>
<td>1. The system shall be implementable following the same technical architecture in all the retail banks from the Netherlands which want to offer their customers VAS.</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>2. The system shall be implementable following the same technical architecture in all the stores from the Netherlands which want to offer their customers VAS.</td>
<td>Partial</td>
</tr>
<tr>
<td><strong>Compatibility</strong></td>
<td>1. The system shall be compatible with all the existing smartphones on the market.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not require changes on the terminal level</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>3. The system shall not require changes on the payment infrastructure level</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>1. The system shall not allow unauthorized access to the user’s VAS account</td>
<td>Partial</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not allow unauthorized access to the store’s database</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>3. The system shall not allow the use of fake VAS</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>4. The system shall not allow unauthorized access to the bank’s database</td>
<td>Partial</td>
</tr>
<tr>
<td><strong>Configurable</strong></td>
<td>1. The system shall allow the user to specifically select which stores he wants to get VAS from</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall allow the user to personalize the way he uses his VAS</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>3. The system shall allow merchants at any time to personalize their VAS offering</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Payment instrument indep</strong></td>
<td>1. The collected VAS shall be usable with card payments</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The collected VAS shall be usable with online payments</td>
<td>Yes</td>
</tr>
<tr>
<td>Ease of use</td>
<td>1. Collecting and using VAS shall be simple and intuitive</td>
<td>Yes</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>2. Applying VAS by the clerks shall be simple and intuitive</td>
<td>Yes</td>
</tr>
<tr>
<td>Privacy</td>
<td>1. The system shall not disclose the identity of the end-user towards any party, other than his/her retail bank which offers the services.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall not disclose any payment information other than the ones that are already known by the stakeholders in the payment chain</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>3. The system shall transparently present to the user all the information and to whom will be disclosed, if he chooses to use the VAS.</td>
<td>Yes</td>
</tr>
<tr>
<td>Flow</td>
<td>1. The collecting of VAS shall be seamlessly integrated in the payment process, requiring no extra action on the user’s side</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall allow the user to select and configure what VAS to use before he reaches the cash register, minimizing the check-out time.</td>
<td>Partial</td>
</tr>
<tr>
<td>Flexibility</td>
<td>1. The system shall allow any number of merchants to join</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>2. The system shall allow both large and small merchants to join</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>3. Merchants shall be able to join and leave the system at any time</td>
<td>Yes</td>
</tr>
<tr>
<td>Ease of integration</td>
<td>1. The system shall be compatible with the current software running on the merchant ECR</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2. The system shall be compatible with the merchant’s current backend system</td>
<td>No</td>
</tr>
</tbody>
</table>

*Table 25: Bank ID Values and Norms support*

Now that we have identified 4 technical directions in which the new system design can present an overview of their norm support in

Table 26 below. The next section of the chapter will be dedicated to choosing and detailing one technical alternative in scenarios and improving the weak points.

<table>
<thead>
<tr>
<th>Technology</th>
<th>M/Chip Advance</th>
<th>Barcode</th>
<th>NFC</th>
<th>Bank ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norms supported</td>
<td>12</td>
<td>19</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Norms partially supported</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Norms not supported</td>
<td>11</td>
<td>6</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

*Table 26: Technical alternatives - no of norms supported, partially supported and not supported*
Now that we have identified the technical alternatives to implement the VAS system and the way each alternatives hinders or supports the norms, we have answered the first two sub-questions from RQ4:  
*What is the best technical implementation for the VAS system?*

<table>
<thead>
<tr>
<th>Research Question 4</th>
<th>What is the best technical implementation for the VAS system?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Sub-question 1</td>
<td>What are the technical alternatives for implementing the VAS system?</td>
</tr>
<tr>
<td>✓ Sub-question 2</td>
<td>How does each technical alternative support/ hinder the values previously prioritized?</td>
</tr>
</tbody>
</table>

4.3  New system design

We can now see that there are two technical alternatives which support the same number of norms: barcode and bank ID. Although the numbers of norms supported is the largest (19) in both alternatives, the ones that are not supported are more for the barcode technology. So bank ID is the better alternative. Nonetheless, we will try to improve the weak points of bank ID by adding technical elements and strong points from the barcode alternative.

**Constructive Technology Assessment** was the approach taken from this point on, as a participatory design method. Originating in the quasi-evolutionary theory, this paradigm builds on the same principle as VSD, namely that technological artifacts are deeply embedded in socio-technical systems so the stakeholder’s needs, values and interests should shape the new artifact. It goes a step further though by underlining the importance of involving the stakeholders directly and actively before (ex-ante) and during the design of a technical artifact (Pesch, 2014). A *scenario workshop* was used as a tool for refining the bank ID technical solution. In this workshop, possible future states of the system were assessed as a way to clear up some uncertainties. The advantage of focusing on future scenarios in which the system is used lies in the fact that the stakeholders are not stuck only to the core chosen technology (bank ID in our case), but try to focus on blending different elements in such a way that the scenario enhances and supports as many values as possible. It is focused more on the end-results, the scenario, rather than just the chosen technology. This might imply introducing elements from the other technical alternatives. Moreover it helps the stakeholders imagine a more consistent state of the future (Pesch, 2014). Because of the exploratory nature of scenario analysis and its lack of scientific rigor, we did not apply this methodology from the beginning of our technical investigations for choosing a technological alternative. But we are applying it now to improve the scientifically chosen alternative. The scenario workshop also had the role of demonstrating the app and partially validating the design to that stage.

A compromise was made for this workshop, namely the same one as with the interviews: since gathering all the stakeholders in a room would have been very difficult, and unfeasible from the business perspective, the UL TS consultants acted as representatives of the stakeholders. We acknowledge this as another limitation of our study. The workshop was organized as follows: an official email was sent to the entire UL TS Advisory Service Line, describing what the workshop consists of and when it is going to take place. The email also contained a meeting invitation asking the consultants who are interested in participating at the workshop to confirm their presence, so that the workshop can be prepared for sufficient people (printed materials, chairs and so on). The timeslot was not randomly chosen, because before sending this email the researcher had been asking his colleagues.
(the UL TS consultants) during lunch breaks/coffee breaks which day and time would suit them best for such a workshop. The time was settled for 11.00 – 12.00 on the 26th of August, but the workshop was actually extended until 12.30 because of the increase interest that the consultants showed in the topic. 1 operations manager, 4 senior consultants (more than 3 years of experience) and 4 junior consultants (less than 1 year of experience) took part in the workshop. Only the operations manager and 1 of the senior consultants also took part in the semi-structured interviews conducted in the earlier stage of our research, which made the findings of this workshop even more valuable because it brought new ideas and points of view on the usage of the future system which were previously unexplored. The stakeholders were quite well represented since 5 of the consultants present were part of the Banking team, so they could represent quite well the interests of retail banks, 1 consultant was from the Payment Institutions team, 2 consultants were from the Mobile team, and the operations manager has extensive knowledge of all markets and stakeholders involved. The workshop was recorded using the same the hardware (Samsung Galaxy S3 smart phone) and software (Smart Recorder for Android 4.1) tools as the researcher used during the semi-structured interviews.

The three main scenarios that were presented to the consultants during the workshop are: firstly when the Customer and respectively the Merchant signs up for VAS, secondly when the Customer collects VAS, and finally when the Customer uses the VAS in the store. These scenarios overlap with the three main ways of using the system and they were presented from the technical architecture perspective. At the beginning of the workshop, each consultant was handed a print-out containing 3 technical architectures, one for each scenario. After presenting the first scenario, the researcher encouraged the participants to bring in their view on the presented scenario, after which the researcher moved to the second scenario and so on. Several ideas, concerns and discussions were raised during the presentation of each of the scenarios and they can be found summarized in Appendix D: Scenario Workshop Findings. After finishing the discussion on the scenarios, the first increment of the demo application was presented to the participants. All the feedback (scenarios + demo) from the participants was used to refine the technical architecture and the demo, bringing it to its current state which will be presented further on in this section.

But before we move on to the future scenarios for using the system and the demo app, some details still need clarification. The roles involved in implementing this technical alternative are the following: Customer, Merchant, VAS Provider and Issuer. As presented during Chapter 3: Stakeholder Map these roles can be played by different actors from multiple communities of practice. The focus of our research is not on providing a solution for who should play or should not play these roles, and what the business incentives for that are. Instead we are focusing on explaining how these roles fit into the technical architecture, and what each role brings to the technical solution.

Going back to the practical problem that the current research wants to solve, we underline that we are designing a VAS system in such a way that the retail banks offer these services to their Customers. So the approach in the current research is an “Issuer-centric” one, which means that the point of interaction for the end-user with the system will be via his retail bank platform. The services are thus offered via the bank app/website. The home banking app/ bank payment app provided by the retail bank can be customized to show another type of account besides the classic Payment Account. We named this the VAS Account. This can be seen in Figure 16 below which depicts a home banking application which has been adapted to include value added services.
Nonetheless, when accessing the VAS Account, we notice that all the Merchants offering VAS have a strong visibility in this app with their own brand and logo, so the user perceives that even though the services are offered by his retail bank, they are offered in collaboration with and for/towards the Merchant’s products. This was an aspect underlined both in the interviews but also during the scenario workshop: Merchants want visibility if they were to join an Issuer-centric platform. So this way we are also supporting the value “Visibility”, even though it was not among the 10 most important. We also mention that all major three retail banks need to offer these services to their Customers, otherwise the Merchants will not have a strong enough incentive to adopt it, and otherwise standardization would not be possible.

A second approach, different from the “Issuer-centric” one would have been a “Merchant-centric” design. This would have displayed the VAS Account in each Merchant’s app, and the user would have perceived the services as being offered by the Merchant for his own products, not the bank. Some good reasons for not doing this were given by the consultants during the scenario workshop: if every Merchant would offer and store his rewards in his own app/website account we would only move the problem from our wallets (where we have a lot of loyalty cards, membership cards, coupons and so on) to our phone where we would have a lot of apps and accounts, merely an app for every Merchant.

A second reason is that consumer studies specifically conducted by banks showed that Customers trust their banks more with retaining and displaying their VAS like digital receipts, than any other institutions like Merchants or 3rd parties. It is also quite intuitive, since Customers already trust their banks with their money and their banks already know their shopping behavior to a certain extent (the shops they prefer, the amount they spend at each store and the time when they shop).

A third approach would have been a “Vas Provider – centric” one. This option implies that the services are offered by the same model as the “Issuer-centric” approach, but instead of using the bank app we use a VAS provider app. But the problem appears in the case where we have multiple VAS Providers, like in the Netherlands where we have Intersolve and My Order. Who brands the app? Or do we have again multiple apps, one for each VAS Provider, with its associated Merchants? And how does this solve the bank’s problem? Because consumers will not perceive it as a service from their bank. Even if there would be a central app for all VAS providers and Merchants, there is still the problem of
consumer trust, which at the moment is highest in the banks as the previously mentioned studies show. A second problem would be that of availability, as one operations manager pointed out during the scenario workshop: how does the Customer have the guarantee that a VAS Provider will be there in 2 years’ time to offer him access to his 2 year old receipts? Considering a VAS Provider can be any IT company with any kind of IT infrastructure, a continuous service offering cannot be guaranteed. The same thing cannot be said about retail banks which have more experience in storing and making data available in the long run. We believe that the previous paragraphs offer a sufficient incentive for an “Issuer-centric” ecosystem, so we will further move on to the first scenario: signing up for VAS.

4.3.1 Scenario 1: Signing up for VAS

The first thing a Customer has to do in order to benefit from VAS is to choose to benefit from this services. He can give his/her explicit consent towards the retail bank via a “sign-up” or “opt-in” feature of the system. After accessing the VAS Account, and choosing one of the Merchants which are taking part in the VAS program, he has a toggle button to activate VAS from that specific Merchant. If he turns on the service, a disclaimer will pop-up by which the bank transparently presents what kind of data will be shared with the Merchant, and what kind of impact this would have. As the workshop revealed, the bank should also mention that none of the VAS data like receipts or loyalty points or any other kind of shopping behavior will be sold/shared with 3rd parties. This is quite important since in 2014 an executive from ING publicly stated that they are thinking about commercializing consumer transaction data, and this impacted the consumer trust negatively, turning it into a huge press scandal. In the end they did not commercialize anything because it was not accepted by the public. But in order to avoid this kind of situations, this disclaimer should also contain the bank’s legal binding to store, access, process the Customer’s data, but never commercialize it or share it with 3rd parties. Once the user accepts the terms and agreements, the button can toggle to “ON” and the value added services offered by the store can be displayed on the screen. So by implementing this transparent way of signing up for VAS, the user “Trust” is another value that we incorporated in the design, even though it was not among the 10 used to guide our technical alternatives selection.

When the user decides that he/she does not want VAS for that store anymore, he/she turns the switch to “OFF”, the VAS offered by the store disappears, but not before asking if the Customer is sure that he/she wants to give up VAS from that specific Merchant. Figure 17 below depicts when screens for signing up for VAS at a store, for example Albert Heijn.
A note worth mentioning is that for exemplifying the sign-up process we chose a mobile app, but the same mechanism can be implemented in a banking website. Also, to make the signing up process more payment instrument independent, the Customer could even sign-up at the cash register after paying, when the clerk asks him/her if he/she wants to further benefit from VAS from that store, in their bank account. But these are alternative scenarios which the current technical architecture supports, if the banks offering the service decide to extend it.

The blueprint in Figure 18 shows what happens on a technical level when the Customer signs-up. In this picture, the Issuer is, besides being the party that displays the VAS in his app/website, the party that also provides Customer identification towards the VAS Provider, and makes sure that the Customer’s privacy is protected. Because in order to collect rewards or any VAS the VAS Provider needs to know to which account he should give the rewards. For this purpose, for a single Customer, the Issuer creates a different pseudo-ID for each Merchant where the customer signs-up for VAS. Based on this pseudo-ID the VAS Provider creates a VAS Account in his database, which is tied to the specific Merchant. So in the VAS Provider database, every Customer has multiple VAS Accounts, one for each different Merchant, but VAS Provider does not know which accounts belong to a single customer. This way, the VAS Provider offering services to multiple Merchants could not profile a Customer based on his/her VAS Account, since all he knows are a multitude of VAS Accounts associated with a multitude of Merchants, without knowing the real Customer identity behind those accounts. So even if multiple Merchants come together they cannot profile a Customer based on his shopping behavior, since they do not know his real identity and for each Merchant that Customer has a different pseudo-identity, which is used just to know which account the rewards shall be sent to. But as it was evaluated in the previous section, for the Security value, the norm “4. The system shall not allow unauthorized access to the bank’s database” was just partially supported. The reason is because opening up APIs through which the Issuer offers identification services to VAS Providers could create some vulnerability risks for the Issuer. This aspect has to be handled with maximum care, using the best practice security mechanisms and algorithms currently available in software development and API opening. An interesting question raised during the workshop was if banks are allowed legally to offer identification services, but this is not defined yet even for industry experts.
But the Merchants also have to sign-up for having their offers digitized into VAS. This easiest, most flexible and intuitive way to do this is that the Merchant sign-up on the VAS Provider website. A simple and intuitive interface can be shown there in which the Merchant signs-up and eventually logs-in with his Merchant identifier. Then he can personalize his offers in real time, choose what type of rewards he wants to give, for what type of products, amounts and so on. Because the VAS Provider service offering is out of our scope, this website is not designed or presented in the current research, leaving the implementation options opened to the specific VAS Providers which will work with the Merchants. The idea is that this way of joining the VAS system is more flexible towards the Merchants than having predefined contracts where the rewarding scheme and options are “hardcoded”.

Once the Customer is signed-up, we move on to the next scenario which was discussed during the workshop, namely the collection of VAS.
### 4.3.2 Scenario 2: Collecting VAS

An interesting first discussion raised during the workshop was related to how Customers collect VAS. In the current technical architecture, we treated the case where he/she gets the VAS as a reward after a payment. But what about VAS which are not received as rewards after a transaction? For example, if a Customer wants to buy a specific product he can nowadays browse magazines/ websites in order to look for discount coupons for that specific product. This case is not included in the current technical architecture, but with minimum integration efforts some VAS (discount vouchers, gift cards etc.) can be collected from different websites and apps for example, and not only received as a reward after a transaction. Again, this decision does not influence the core architecture of our system. But our interviews indicated that the Netherlands is not so much a couponing country, but more focused on loyalty cards, membership/bonus cards, gift cards.

The architecture presented further for collecting VAS treats the scenario where every VAS is received as a reward following a successful transaction. These VAS can be receipts, loyalty points, discount coupon/voucher, gift card or a membership card. A second aspect discussed during the workshop was related to the security of the channel between the Merchant - VAS Provider, and the channel VAS Provider - Issuer. This is the channel through which, over-the-internet, the VAS related data is being transferred from the Merchant to the Customer. By default this is not a secure connection, in the sense that it is not as secured as the payment connection, it is just a simple internet connection. Which is why for the Security value, the norm “1. The system shall not allow unauthorized access to the user’s VAS account” was only partially supported in the analysis done in the previous section. This is because at any point on this channel the VAS data could be intercepted by malicious parties, if extra security mechanisms are not implemented. The consultants’ suggestion to fully support this norm is to create a VPN (Virtual Private Network) type of connection for this channel. This way the data cannot be intercepted as easily as on the standard TLS (Transport Layer Security) cryptographic protocol usually used over the internet. The increase in costs is also insignificantly higher, so the alternative is feasible also from a business perspective. The technical blueprint in Figure 19 on the following page presents the sequence of events taking place when a user receives a VAS after a transaction.

We will not go through the sequence of steps again, as these are illustrated in the picture, but we will provide extra explanations on aspects which the figure does not clarify. A first note worth mentioning is that in the technical blueprint the “transaction ID” is not a unique identifier, but we generate that identifier in such a way that is unique, from several other identifiers available during a transaction: transaction number, date, terminal number, merchant ID and so on. Another note worth mentioning is that a very big advantage of our architecture is clear now: no matter if the customer pays by card, mobile or on an e-commerce website, he can still collect rewards. Collecting the rewards is not tied to the payment instrument or to any other tools. Also the increase in flow is a strength of our architecture, since it allows the collection of points seamlessly and integrated into the payment process. Nonetheless, the Customer receives a Google Cloud Messaging notification on his phone/computer every time he gains the reward in order to increase “Awareness”. Another value which although it is not ranked among the 10 most important, it matters for some stakeholder, is introduced in our system design.
Figure 19: Customer Collecting VAS Technical Architecture
Figure 20 below, illustrates the VAS account for AH before receiving VAS, the Google Cloud Messaging Notification with the value of the reward, and finally the updated account.

As it can be seen in the technical architecture, the Merchant is actually telling the VAS provider to reward a transaction based on the “transaction ID”, which is generated from several other identifiers available in the Merchant backend. This means that the Merchant does not know which customer he is rewarding, but he is telling to the VAS Provider to reward the VAS Account of whoever is responsible for making the transaction with the identifier “transaction ID”. The VAS Provider computes the rewards based on list of items, amount etc. and based on how the Merchant configured his rewarding system rules on the VAS Provider website, when he signed up for having his offers digitized (detailed in 4.3.1 Signing up for VAS). The VAS Provider now knows the value of the reward and the transaction ID which has to be rewarded, but he still does not know which VAS Account he should update with that reward. So the Issuer tells him the pseudo-ID (explained and calculated in the previous section 4.3.1 Signing up for VAS) associated with the customer who made the transaction with “transaction ID”, after the payment was completed. Based on that pseudo-ID the VAS Provider identifies the VAS Account which he has to reward. Again, he does not know who that person is, he just knows that he has to update with that reward a certain VAS Account for the respective Merchant. Having this kind of information separation between different parties ensures that each party still has valuable information to make the system work, but each party cannot use more than the information they have for purposes which would break the customer’s trust or privacy.

A discussion raised also during the workshop was related to the standardization of this type of architecture. There is a great variety of ECRs out there and it is very difficult to standardize the interface with all Merchants, from the VAS Provider. A lot of data needs to be exchanged between each Merchant and VAS Provider, data based on which the VAS Provider knows how to compute and give rewards (list of items, time of transaction, value of transaction, transaction ID and so on). This weakness of the system was also reflected in our analysis of the Standardization norms which are only partially supported by this technical alternative: “1. The system shall be implementable following the same technical architecture in all the retail banks from the Netherlands which want to offer their
customers VAS. “ and “2.   The system shall be implementable following the same technical architecture in all the stores from the Netherlands which want to offer their customers VAS.” Partially supported because a standard could be developed, but this is a very difficult challenge to overcome, because of the great ECRs variety. This problem reflects also in the Ease of integration value and its norms: “1.  The system shall be compatible with the current software running on the merchant ECR” and “2.  The system shall be compatible with the merchant’s current backend system” which are not supported by this technical alternative by default. As a solution to these problems, we chose to make the VAS Provider integration via the Merchant backend, thus not having to make major changes on the ECR level. Integrating the Merchant backend (basically his computers/ servers) with the VAS Provider ones is easier than updating ECRs. Nonetheless this brought to light a new problem, namely in one of the flexibility norms: “2.  The system shall allow both large and small merchants to join” which is also not supported by our current architecture. This problem arises from the fact that small Merchants do not have a dedicated ECR and a backend system, they only have a POS, so this type of integration will not work for them. One of the consultants came with a solution to this problem: mobile POSs. Nowadays technologies are developed for transforming any table or smartphone into an ECR with an integrated POS, so providing these Merchants tablets or mobile devices which can be turned into mobile POSs could be the solution to this problem. This way they would have a minimum backend system which can be connected via the internet to the VAS Provider.

Finally a last point raised while discussing the VAS collection scenario was related to the individual rewarding plans: since the Merchant is rewarding a transaction not a person, he cannot give individualized rewards, like birthday coupons. This is the trade-off that our architecture makes to protect the Customer privacy. If this turns out to be an important request from users, an option can be easily tailored into our architecture: if the user chooses to go for individualized rewards, he gets a message warning him that more of his data will be revealed to the VAS Provider and Merchants, and after accepting this term/ condition he will further benefit from these individualized rewarding plans.

4.3.3 Scenario 3: Using VAS

The last scenario discussed during the workshop was about the situation when the customer wants to redeem or use the gained VAS. The using of rewards presents a limitation of our proposed architecture though, which we will point out in the following paragraphs. First let us explain the basic mechanism and flow employed in order to use a reward: in his banking app, after accessing his VAS Account, and the Merchant’s specific section in that account, the Consumer has to click the “Use” button associated with a specific reward. He can then customize how much of the reward he wants to use, if that type of VAS allows it (for example he can choose how many of the loyalty points he wants to use on that shopping session). Then the VAS Provider generates a unique barcode for that reward, which is displayed on his phone screen, as it can be seen in Figure 21 below.
The Customer then presents his smartphone with the barcode at the cash register to the Sales Assistant, which scans this barcode and the associated reward is applied in the merchant’s backend, after the barcode is checked for authenticity and rewarding content with the VAS Provider. A similar principle can be applied in online shopping where the customer just copy-pastes the barcode number before he finalizes the payment. By allowing the Customer to select and configure the VAS he wants to use before he actually reaches the cash register (even before leaving his home if he does not have internet access in the store) and gets involved in the payment process, increases the flow at the Merchant’s cash register. So it improves the check-out times and reduces friction, but as mentioned earlier it has a limitation: the Customer must initially click the “Use” button associated to the reward, which means that he/she has to redeem the reward with the help of a smartphone, tablet or computer, basically any device through which his VAS Account could be accessed over the Internet, and the request to generate the barcode forwarded to the VAS Provider. If he only has his payment card with him, he cannot use the reward with the current implementation.

A fix to this problem could be that the Sales Assistant asks the customer at the cash register if he wants to use one of his existing VAS, and then he would ask the Customer which VAS, and how much of it and so on. This works great for the AirMiles program, because the options are not so customizable: the Customer only has AirMiles and the Sales Assistant only asks if and how many AirMiles he wants to use. Having also discount coupons/vouchers, gift cards, membership cards and so on to choose from would greatly increase the friction during the payment process, would increase also the queue length and check-out times and would imply that the Sales Assistants need more training with the system. Considering all the previous benefits presented until now of our chosen architecture we
accept this as the biggest and most important limitation of our system. But in the end, even if a Customer cannot redeem a VAS at a certain moment because for example he does not have any battery left in his smartphone, rewards can still be collected regardless of the payment means and they can be used during a further shopping session. So the value of these services is not completely lost to the Customer. We expect this limitation to be minimum as the smartphone complementary technology evolve so when the batteries become more reliable and long-lasting. As one of the consultants mentioned, for receipts this flow does not apply because the receipts do not need to be dynamically generated. Instead we implemented a separate option for the Customer to visualize his receipts, as it can be seen in Figure 22 below. The flow of events for rewards-based VAS is depicted in Figure 23 on the next page.

Figure 22: Receipt from Albert Heijn
Figure 23: Customer Using VAS Technical Architecture
Finally, the last sub-question of RQ4: *What is the best technical implementation for the VAS system?* has been answered with the help of these three scenarios.

<table>
<thead>
<tr>
<th>Research Question 4</th>
<th>What is the best technical implementation for the VAS system?</th>
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<tbody>
<tr>
<td>✓ Sub-question 3</td>
<td>What is the detailed technical architecture and the usage scenarios for the chosen alternative?</td>
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</table>

With the two sections: 4.2 Technical Alternatives and 4.3 New System Design we have answered fully answered RQ4: *What is the best technical implementation for the VAS system?*

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</tr>
<tr>
<td>✓ Sub-question 3</td>
<td>What is the detailed technical architecture and the usage scenarios for the chosen alternative?</td>
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</tbody>
</table>

Figure 24 below illustrates the progress of our research, where all the research questions have been fully answered. This means that the research objective has been reached and we have now managed to *Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that account for human values.*

The output of this chapter, along with the findings of the other chapters will be used to further answer our main research question, which focuses on the *how:* *How can Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach?*
Main Research Question

*How can Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach?*

**RQ1 - Chapter 1**

What is the problem to be solved?
- SQ1: practical problem
- SQ2: scientific problem

**RQ2 – Chapter 2**

What are the relevant payment and VAS technologies?
- SQ1: digital payment instruments
- SQ2: value added services

**RQ3 – Chapter 3**

What is the stakeholder map?
- SQ1: direct & indirect stakeholders
- SQ2: stakeholders' interests
- SQ3: stakeholders' values
- SQ4: prioritization
- SQ5: design requirements

**RQ4 – Chapter 4**

What is the best technical implementation for the VAS system?
- SQ1: technical alternatives
- SQ2: value support
- SQ3: detailed design

Research Objective

*Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values*

*Figure 24: Research Flow*
Chapter 5: Conclusions
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5.1 Relevance

The current chapter summarizes the most important points of our research effort. We have successfully developed a system for integrating digital Value Added Services into the payment process, thus increasing the quality of the retail bank’s service offering. The system was designed in such a way that it accounts for human and system values before the design. In order to accomplish this, several research questions needed to be answered, using multiple research methods for this purpose. The conclusions of our research effort will be presented in the remaining sections of this chapter.

Section 5.2 Main Findings treats the main findings follow each research question and analyzing the logical flow from one question to the next, and finally into reaching the research objective. Then it tries to answer the main research question, based on these findings. The following two sections, 5.3 Academic Contributions and 5.4 Practical Contributions, underline the impact of our research in the academic world and in the society/organization respectively, as the name of these sections suggest. Some aspects of the research that hamper the generalization of our findings will be discussed in the next section 5.5 Limitations, while the section 5.6 Further Developments presents possible future directions for new research to build upon the current paper, either to extend it into new areas or to overcome the current limitations. Finally, 5.7 Reflections looks at the project from a distance by analyze aspects such as process, the choices made, and the connection with the Management of Technology MSc study program.

5.2 Main Findings

The objective of our research was to:

| Research Objective | Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values. |

To reach this goal, the main research question was formulated as follows:

| Main Research Question | How can payment Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach? |

But in order to answer this question, four research questions were identified and answered. The first research question is detailed in the table below:

<table>
<thead>
<tr>
<th>Research Question 1</th>
<th>What is the problem that needs to be solved?</th>
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<tbody>
<tr>
<td>✓ Sub-question 1</td>
<td>What is the underlying practical problem? What is the difference between the real state and the desired of things?</td>
</tr>
<tr>
<td>✓ Sub-question 2</td>
<td>What is the scientific problem? What are the gaps in the academic body of knowledge</td>
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</table>
The first sub-question from the first research question was answered by doing a desk-research on press releases, magazines, news, and specialized websites in order to find out what is the underlying problem of the industry. The research revealed that although there is a tendency in the payment industry to digitize, automate and standardize the payment process, not the same thing can be said about value-added services on top of payment. The problem owners in our research are banks because their service offering is being threatened by IT companies that recently started offering payment services. Besides the core service of payment, these IT companies have a competitive advantage over banks because they started making steps into digitizing also value-added services, although these attempts are not standardize or adopted on a wide scale. This leaves room for the banks to leverage their user base and the position in the market and get a first mover’s advantage in the Netherlands. The second sub-question, regarding the scientific problem was answered by doing several literature reviews. Two knowledge gaps were found in the academic body of knowledge: first of all there is no technical research offering a VAS system seamlessly integrated with payments and secondly there are no studies applying a value sensitive approach to the design of payment systems.

Moving on to the next research question, this is detailed in the table below:

<table>
<thead>
<tr>
<th>Research Question 2</th>
<th><strong>What are the technologies that the system might be compatible with?</strong></th>
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<tbody>
<tr>
<td>✓ Sub-question 1</td>
<td><strong>What are the digital payment means that the system might be compatible with?</strong></td>
</tr>
<tr>
<td>✓ Sub-question 2</td>
<td><strong>What are the value added services that the system might support?</strong></td>
</tr>
</tbody>
</table>

Both sub-questions were answered by doing desk-research and attending specialized trainings. This research question is built on the output of the previous one, because in order to design a digital value-added services system which is seamlessly integrated into the payment process in the Netherlands we first need to know what the payment means/instruments are in the Dutch market, and then we need to know what value-added can be digitized and what their presence in the Dutch market is. The digital payments have been classified by location (online and brick-and-mortar stores), amount (micro and macro payments), by technology (card, online, mobile) and by type of participants (e.g. business-to-business, business-to-consumer). Value added services have been classified into VAS for consumers (receipts, gift cards, loyalty points, bonus/ membership cards, discount coupons/ vouchers) and VAS for merchants (replacing online check-out with check-in and analytics services).

Research question number three is detailed in the table below:

<table>
<thead>
<tr>
<th>Research Question 3</th>
<th><strong>What is the stakeholder map?</strong></th>
</tr>
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<tbody>
<tr>
<td>✓ Sub-question 1</td>
<td><strong>Who are the direct and indirect stakeholders for the VAS System? What are the communities of practice?</strong></td>
</tr>
<tr>
<td>✓ Sub-question 2</td>
<td><strong>What are their interests?</strong></td>
</tr>
<tr>
<td>✓ Sub-question 3</td>
<td><strong>What are their values?</strong></td>
</tr>
</tbody>
</table>
Sub-question 4
What prioritization mechanisms are there in place for the values?

Sub-question 5
How can these values be translated into design requirements?

For answering the first sub-question from this third research question, we analyzed all possible sources or requirements. Starting from the outputs of the previous question, we analyzed sources like previous projects conducted in UL TS that were related to the previously identified payment types and VAS types, but also interviewed the UL TS consultants, which were acting as stakeholder representatives. But before that a clear definition of the terms stakeholder was given using sources from requirements engineering and value sensitive design. A differentiation between roles, actors and stakeholders was also done. The notion of community of practice was introduced, and after the main roles relevant roles for the VAS System were identified, the stakeholders playing those roles were divided into the following communities of practice: End-Users, Store Executives, Sales Assistants, Brick-and-Mortar Acquirers & Payment Service Providers, Terminal and ECR Vendors, Schemes, Regulatory Bodies, Processors, Retail Banks, Payment Institutions, Specialized Software Companies, Software Developers, Mobile Network Operators and Original Equipment Manufacturers. The interest of each community were extracted based on the interviews, thus answering the second sub-question. Values were then extracted from these interests, using a conceptualization process often found in VSD. For the End-Users, a through literature review was also conducted in order to extract the human and system values relevant for the VAS System. Having a list of relevant values for each community of practice, sub-question number three was also answered. For answering the forth sub-question, the Boundary Object concept was applied in order to prioritize the values to be introduced in the new system design, by selecting the common values which are present in at least 3 communities of practice. There was a total of 10 values meeting this requirement: standardization, compatibility, security, configurable, payment instrument independence, ease of use, privacy, flow, flexibility, and ease of integration. Finally, these values were translated into end-norms which served as more concrete design requirements, by using the specification mechanism defined in value hierarchies.

Research question number four, which is the last out of the research questions, is described below:

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The first sub-question was answered after applying the funneling technique after a desk research on the related projects from the UL TS repository, but also with the help of specialized training. Four technical alternatives were selected as the main possibilities for implementing the VAS System: the MasterCard PayPass 3.0 M/Chip Advance, the Barcode technology, the NFC Technology and Bank ID. Each alternative was weighted against each of the previously specified end-norms. A decision matrix
was built to evaluate to what each technical alternative supports, partially supports or does not support the norms. The best alternative was selected as the one that supports most norms, and does not support the least amount of norms. Sub-question two was consequently answered. The best alternative was then developed into an improved architecture by combining it with the strong points of the other alternatives in order to support even more values than the 10 prioritized ones. This architecture was enriched with ideas collected during a scenario workshop conducted with the UL TS consultants. Three scenarios, which represent future states in which the system can be used were presented during the workshop: signing up for VAS, collecting VAS and using VAS.

At this point the VAS System was fully designed to support as many human and system values as possible. Our research objective was reached:

| Research Objective | Design a system that allows banks to integrate Value Added Services with their digital payment methods, and that accounts for human values. |

The overview of the steps, methods and answers to the research questions constitute the answer to the main research question:

| Main Research Question | How can payment Value Added Services in the Netherlands be digitized and integrated in the payment process, following a human value centric approach? |

We will further analyze the contributions that our research effort has made to the academic body of knowledge and to the payment industry.

5.3 Academic Contributions

As stated in the previous section, the current research tries to bridge two gaps in the academic body of knowledge: the inexistence of a technical study on how to integrate VAS with payment, and the inexistence of a value-sensitive approach design to payment technologies. While these are the two major scientific contributions of our paper, they are not the only ones: as presented earlier, in trying to answer the research questions several relevant methodologies and concepts were combined in new ways which might prove valuable for other scientific studies and scholars.

To begin with, for the first time in academic research a Value Sensitive Design approach was taken towards payment technologies. The research method was used before in computer science, especially in human-machine interaction but never in the payment industry. Not only have we raised the importance of introducing human and system values into the design of these innovative technologies, but we also tried to overcome the limitations of the VSD methodology with additional tools.

One of the limitations of VSD is that it does not offer a clear methodology of identifying stakeholders (Manders-Huits, 2011). We tried to strengthen this in our research in two ways. First of all we conducted an investigation on the exact meaning of the different terms often used interchangeably with the term stakeholder within academic research and the industry. We believe understanding the exact meaning and differences between terms such as actors, roles, and stakeholders is the first step into making the stakeholder identification process more methodological, and is an improvement over
the current inexistent stakeholder identification methods offered by VSD. Secondly, using practices and methods from the requirements elicitation phase in software development, we managed to create a step-by-step approach for the actual stakeholder identification process. We believe that the methodologies offered by requirements elicitation in the software development industry can be successfully applied to any VSD project, not only the ones related to software development. The reason is because identifying the stakeholders is a common need regardless of the type of industry or the technology developed, so these methodologies could greatly increase the methodological strength of VSD.

Another limitation of VSD as pointed out by (Manders-Huits, 2011) where our research contributes is on the fact that VSD does not have a concrete method for prioritizing values and making values trade-offs. For this purpose we turned to social sciences, namely the concept of Boundary Object as defined by (Star & Griesemer, 1989): "...those objects that both inhabit several communities of practice and satisfy the informational requirements of each of them. Boundary objects are thus both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use and become strongly structured in individual-site use. These objects may be abstract or concrete... Such objects have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is a key process in developing and maintaining coherence across intersecting communities." We applied this concept for the values extracted from the communities of practice in which we have grouped the stakeholders. But instead of looking at the common knowledge across these communities, we only looked at the common values. The values that were found important for at least three communities, were the ones selected by us to define the Boundary Object. We believe that this way of prioritizing and making trade-offs among values can be used in any VSD project, regardless of its topic or developed technology and it can add a lot of objectivity to this step of VSD. Since no academic research has tried combining VSD with the Boundary Object concept before, we consider this one of the most important academic contributions of our research effort. There are still some other limitations of VSD which our Boundary Object approach has not covered, but these will be covered during a later section.

The next academic contribution consists of the fact that we combined the sequential structured approach of Design Science Research Methodology with the Value Sensitive Design Methodology. The reason for this approach was the following: while VSD does indeed identify a series of steps for designing a technical artifact, it does not offer a sequential, step-by-step approach on how to blend the conceptual, empirical, and technical investigations. It only suggests that this should be done in an iterative way, and that these three types of investigations should be intertwined (Friedman et al., 2006) and conducted somehow simultaneously. Nonetheless, it does not offer an exact description of what each iteration consists of. This is where DSRM comes in: each iteration follows five of the six steps in design science cycle, on which we mapped the empirical, conceptual and technical investigations, according to each DSRM step where they were needed. The five steps in DSMR are: problem identification, develop solutions objective, design & development, demonstration and evaluation. The last step, which is not repeated in each iteration is the communication of the results (Peffers et al., 2008). This can be seen in Figure 2: Research Design Diagram displayed in Chapter 1: Introduction. While our research covers only one iteration cycle, because of the limited time for conducting a master thesis, we still have to acknowledge the strength that the DSMR cycle added to our VSD approach. Which is why we added this aspect as another important academic contribution that can be applied in any VSD project, by simply structuring the steps according to the steps in DSMR.

Last but not least, the current research enriches the academic body of knowledge by providing a technical solution, derived from sound scientific research, for integrating VAS with payments. As pointed out in Chapter 1: Introduction, our literature review identified several scientific papers which
designed Values-Added Services for payments. None of them was flexible, modular and integrated enough, in the sense that either they did not support multiple payment technologies or they were not seamlessly integrated with these payment technology. Our research, via our technical architecture, strived to cover these aspects as much as possible.

5.4 Practical Contributions

While the added value for the academic world was empathized in the previous line, the current section will analyze the practical contributions of our research, which is reflected on three levels: the contribution on a social level, the contribution to the to the banks in the Netherlands which we have defined in Chapter 1: Introduction as the problem owners and finally the contributions to the company where this research was conducted or towards any company which develops payment solutions for that matter.

First of all the contribution of our research on a social level is a major one. As it was systematically pointed out throughout the current paper, technologies are value-laden which means that not only do they support certain values, but also introduce new values into the society. This means that because the technology is so interwoven with society, taking a design approach which specifically accounts for societal values results, at least in theory, in a technology which will not only have a higher degree of social acceptability, but also it will not accidentally introduce unwanted values. This approach has not been taken before in payment technologies. With the increasing concern in ICT system for privacy protection, we believe that our approach to designing the VAS System is greatly beneficial for protecting the values of all stakeholders, but especially for protecting the end-users from merchant profiling, targeted marketing and any kind of unwanted information leakage. This kind of social contribution is even more relevant in the socio-political context of our research, because in the Netherlands the Government has recently raised the concern of privacy for payment technologies like Apple Pay and Google Wallet (Tweede Kamer, 2015). Not only have we specifically addressed this important aspect in our system, but we have created a design which also respects the interests of the other stakeholders, to make sure that the technology does not have any rollout or adoption barriers.

Secondly, taking a look at the practical problem of our research defined in Chapter 1: Introduction, we offered banks a solution which supports their strategy of improving their payment services to survive the battle with the payment institution, namely the new high-tech companies which recently started focusing their business on payments. Our hope is that if banks adopt our suggested standard and implement this technical architecture for the VAS System, they have the chance to gain a first-mover advantage in the Netherlands for VAS, since the payment institutions do not yet have a dominant position for VAS in the Netherlands. While this is not the only solution, our research offers academic proof, with some limitations of course, that this solution is the most feasible one considering the current stakeholders’ context. Not only have we designed a robust architecture which supports the banks’ strategy and the values of the stakeholders, but we gave the parties responsible for implementing the system a certain degree of freedom regarding the implementation details. This kind of extensibility and modularity insures that the core values of the stakeholders are respected, while each party has the option to personalize the system according to its business model. We hope that this feature of the VAS System creates a platform on which banks could further monetize the service of customer identification, thus opening up new business opportunities for them.

Finally, an important contribution is towards the company in which this research was conducted, and towards all companies which want to design payment systems. Taking a design approach which
specifically accounts for social values raises awareness among the engineers and specialists developing the system. The simple fact that we have accounted for more than just the business requirements has raised awareness for social values in system design. As pointed out by (Pesch, 2014), engineers and designers currently lack ‘accountability forums’ which are active ways of guiding moral reflections of individual actors. Applying VSD with its empirical methods, such as interviews with the UL TS consultants, and combining this with CTA via the scenario workshop conducted with the consultants has hopefully given the specialists in UL TS a method for actively reflecting on moral values during system design. This method can be applied to future projects as well, especially because it was pointed out by one senior consultant at UL TS that it is less costly than the consumer surveys, even though it takes more time. This is because we also made use of as much of the existing research on the topic as possible, besides the interviews and scenario workshop. We believe that this approach offered by VSD can be seen as a very important contribution to any company or industry player which aims at designing technical systems that have a high impact on the society.

5.5 Limitations

As is the case with any research effort, our research is also not without limitations. Some of the decisions taken because of limited time, unavailable resources or simply because of methodological limitations might hinder the generalization of our results. We have dedicated the current section to exposing these weaker points of our research.

A first limitation, acknowledged also Chapter 3: Stakeholder Map is related to the empirical investigations for identifying the stakeholder interests. The best practice in the requirements elicitation phase of software development suggest that the stakeholders should be consulted with. One method is via interviews. As it can be seen in Chapter 3: Stakeholder Map there is a large number of stakeholders and communities of practice for the VAS System. For these interviews, the UL TS consultants were used as stakeholder representatives. The main reasons are the following, and they are related to the limited resources: the current research was conducted in 6 months, and is not a project consisting only of requirements elicitation, but also of social research, technical design and demo development, it was very difficult to find the time and availability to schedule interviews with one representative of each stakeholder group. Even if this would have been feasible, the relevance of the interview findings would have been quite low considering there is only one representative of each group. Not to mention that some groups, like Payment Institutions (PayPal, Apple etc.) wouldn’t have been accessible not even by one representative. After some deliberation with the members of the graduation committee it was decided to interview instead the UL TS consultants. The biggest advantage of choosing this option over the previous one, is, besides the availability aspect already mentioned, the fact the each consultant has worked closely with multiple stakeholders from each community of practice throughout his career. This is why we have not chosen junior consultants for the interviews: to make sure that each interviewee can properly represent the interest of the stakeholders he had most interaction with. Nonetheless, we present this approach as a limitation, because the ‘actual stakeholders’ were not interviewed.

A second limitation, following the same reasoning, is that the scenario workshops were organized again with UL TS consultants, not ‘the actual’ stakeholders as CTA suggests. The main problem of organizing this workshop was not the lengthy process from the time’s perspective, but it was the simultaneous availability of the stakeholders: it is basically impossible to gather all our identified stakeholders in the same room for this type of research effort.
A third limitation, consists of the subjectivity factor in the process of extracting values from the stakeholders’ interests. As pointed out in the respective chapter, we tried to use conceptual research which provides standard definitions of values as much as possible to conceptualize the values, but that was not possible for each value. So instead we tried to use common sense and intuition to define some values. Nonetheless we have to acknowledge the fact that if any other researcher would have done the same process, some of the values would have been different. We do not support the fact that this is scientifically sound method for extracting values from interests, but this is more of an exploratory approach, with the purpose of guiding us towards some important values. But even by using a list of predefined values, enormous attention needs to be paid to the context and culture in which those values were defined (Borning & Muller, 2012). We thus underline the fact that our application of the VSD methodology is more of a ‘methodological instantiation of a particular set of values’ rather than claiming that we have overcame the longstanding discussion of value universality in VSD (Borning & Muller, 2012).

The same subjectivity induced by the researcher creates our forth limitation: when the selected values are translated into norms, there is a great amount of specialized knowledge and subjectivity in guiding the process as (Van De Poel, 2013) acknowledges. We again, do not claim that this is the best or the ultimate specification of values into norms. Nor do we claim that these norms are the most important ones. This is just the view of the researcher which detailed the values into a more concrete set of specifications. Because we did not want to amplify this limitation, we stopped the specification process at end-norms which were sufficient for creating the core architecture that supports the values. We did not go to the second step, of specifying end-norms in design requirements as this would have resulted in a less flexible design and less freedom for the system implementers to exercise their own subjectivity in some aspects concerning their own business model.

Finally, a last identified limitation of our study is one affecting the result communication, not so much the research itself. Because of confidentiality reasons some of the projects from the UL TS repository which were used to identify the stakeholders and the main technical alternatives for implementing VAS could not be quoted. The same confidentiality policies applied to the consumer research which some players conducted for this VAS System.

5.6 Further Developments

An interesting direction of development for the current research would constitute de Business Case for the VAS System, as the research coordinator within UL TS has already expressed an interest in. This represents quite e big challenge because of the large number of stakeholders involved. Our suggested technical architecture, with the same roles and stakeholders could be used, and the future research could focus on finding the right business incentives to make this system a viable technology in the current business context.

Another direction of development could be a more social analysis on what kind of effects the wide-scale adoption of such a VAS System would have. Switching costs and lock-in effects could be analyzed, path dependencies and diffusion curves of the technology could be documented.

Further research could also be conducted to improve the limitations of our study: developing a way of making the value conceptualization more objective. For this purpose a thorough literature review could be conducted for every CoP, like we did for the End-Users. The conceptualization of the values found in the literature review is quite documented, and leaves less room for interpretation thus
making it a more scientifically sound method. Also for overcoming limitations, interviews with the actual stakeholders of the system could be organized, and maybe the outcomes could even be compared to the ones from the consultants. On a more technical level, research could be conducted to identify the exact cost and effort needed to technically develop and deploy such a system. Considering our research is quite exploratory in nature, there is a lot of room for diving into any of the sections and conducting a more detailed analysis.

Coincidentally, we did not encounter any contradictory values among the ones that we selected as being the most relevant. Should this have been the case, a more complex way of selecting what values to actually use in the design could be employed: while we just counted which value is considered important in three communities or more, another method would be to assign different weights to each community, according to the importance of the role it needs to play. For example, a MNO’s view regarding a certain value might not be as crucial as the merchant’s view on the same value, because the merchant might refuse to implement the system should that value be disregarded. This is one aspect which we have not considered in our research, and this direction offers a lot of room for improvement.

5.7 Reflections

We have reached the last section of our research and this consists of the reflections on the research process.

It is worth mentioning that writing a master thesis while conducting an internship in one of the top payment consultancy companies in the world has contributed exponentially to my professional development. The choice of the topic and company was not accidental: during one of my ICT courses, the head of the UL TS advisory service line was holding a guest lecture about mobile payments. I had already met the company during an earlier career event, but it was during that lecture for the first time when the topic of electronic payments got my attention. After a recruitment process and further discussions I settled on the broad thesis topic with my internal supervisor, a few months before the start of my internship: Value Added Services. I did not know exactly what approach I wanted to take, but I did know that we have to design a VAS System which might handle some user sensitive data.

In light of this description, my graduation coordinator suggested a human-value centric approach for designing such a system, and thus the VSD approach on the topic started to take shape. The initial stages were a bit slow and difficult because I had to clearly define my research questions and to identify exactly what I want to obtain with my research. But after reading more about VSD and DSRM which I was already familiar with, I started sketching my initial research design. After that, the research questions were developed based on the steps from the DSRM cycle. The sub-questions were developed after reading more about the additional tools that I used, like Boundary Object, semi-structured interviews, CTA with scenario workshops, socio-technical maps and so on. After gaining some basic knowledge on these topics, the development of the research plan went quite smoothly. By the kick-off meeting I had quite a clear direction where my research was heading.

I did however underestimate the workload of some tasks. I had initially planned to complete two iterations of the design cycle, which means I wanted to take the design that I currently have and analyze it, identify eventual problems, conduct new interviews, new technical investigations and so on. There were some variables which I had not considered when making this plan: first of all the area of study was completely new to me on both sides, the academic and the industry one. I have not had
any experience with designing systems in a value-centric way, and I have not had any significant experience (except 2 lectures and 1 assignment) in the vast payment industry and the associated technologies. So the initial desk research took double than I had anticipated, two months instead of one. To top this off, the next setback was organizing the interviews: from the initial 10 days that I had anticipated for the conducting the semi-structured interviews I had reached 21 days and I still had not interviewed all the consultants that I had initially scheduled. The reason was because the consultants also had a very busy schedule and most of them were working at the customer’s location, so a lot of interviews had to be rescheduled and reorganized. Nonetheless, after three weeks I decided to stop at 11 consultants and move on to transcribing the interviews. The decision of transcribing them only after the interviews were all done was also a planning mistake because transcribing took more than anticipated. Yet, the reason why I initially took this decision was because I did not want to be biased in the next interview by the answer from the previous consultant. The interviews were semi-structured, there was a lot of open discussions going on and transcribing an interview would have influenced my ideas and probing questions for the following interview because I would have remembered at least the direction in which the previous interviewee was answering. So it was the best decision for the quality of the research, but from the planning perspective it induced an unanticipated delay. The demo development also took longer than anticipated because for programming the server side I used a technology which was new to me, namely the ASP.NET framework with MSSQL databases. For all the above reasons I decided to delay my graduation for two months, instead of sacrificing the quality of my research or my demo application.

I find this graduation thesis and the topic itself a very suitable one for the Management of Technology study program. To quote the description TU Delft offers on the MoT study program on their website: “In the Management of Technology program you learn to explore and understand technology as a corporate resource - a resource that allows a firm to keep many different balls in the air. It shows how firms can use technology to design and develop products and services that maximize customer satisfaction on the one hand, while maximizing corporate productivity, profitability and competitiveness on the other.” (TU Delft, 2015)

In the current thesis, indeed a technology (digital value-added services) is analyzed and created for a company (bank) in such a way that this company can maximize their customers’ satisfaction, but also improve their chances in the competition with other players (payment institutions). All the courses from the core program have been helpful in creating a knowledge base necessary for understanding the concepts and the overall direction of this research, but the following must be underlined: [MOT1411] Technology Dynamics, [MOT1433] Technology and Strategy, [MOT1441] Social and Scientific Values in MoT, [MOT2311] Quantitative Research Methods. Two courses from the ICT specialization were also very helpful: [SPM9310] E-business, [SPM9631] ICT Design, Valorization and Mobile Applications. Finally, the elective courses I have chosen from the Computer Science faculty have proved to be invaluable in developing the practical part of the thesis: [IN4254] Smartphone Sensing and [IN4400] Programming and data science for the 99%.
Abbreviations

API – Application Programming Interface
B2C - Business-to-Consumer
B2B - Business-to-Business
BLE – Bluetooth Low Energy
C – Consultant
C2B - Consumer-to-Business
CnP – Card Not Present
CoP – Community of Practice
CP – Card Present
CTA – Constructive Technology Assessment
CVM – Customer Verification Method
DNB – Dutch National Bank
EBA – Euro Banking Association
ECB – European Central Bank
ECR – Electronic Cash Register
EFTPOS - Electronic Fund Transfer at Point of Sale
EU – European Union
HCE – Host Card Emulator
IDE – Integrated Development Environment
OTI – Over-the-internet
POS – Point of Sale
PSP – Payment Service Provider
S.C. – Senior Consultant
SDK – Software Development Kit
SE – Secure Element
SMS - Short Messaging Service
SMB – Small to Medium Businesses
PAN – Permanent Account Number
PAR – Payment Account Reference
PSD2 – Payment Service Directive 2
VPN – Virtual Private Network
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Bibliography

- All website references last consulted on October 1st 2015 -


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Appendix A: Interview Protocol

PART 1: Introduction and Formalities

1. Introduce the researcher and the research topic
2. Ask for permission to record
3. Ensure interviewee about their anonymity
4. Inform the interviewee that by continuing he/she expresses his/her consent for the data to be used in the research
5. Inform the interviewee to feel free to address any questions now or at any time during the interview

PART 2: Warm-Up

1. Ask the interviewee to shortly describe his/her experience in the payment industry
2. Ask the interviewee to shortly describe his/her current position and responsibilities

PART 3: Main Section

1. The values that the service/system should account for?
   
   **PROBE: detail upon each of them**
   
   a. Compatibility: with what payment methods should it be compatible?
   b. Universality: what kind of value added services should it contain?
   c. Privacy
   d. Security
   e. Trust
   f. Perceived usefulness
   g. Perceived ease of use
   h. Perceived risk
   i. Flexibility: to what extent should new merchants and offers be able to join the system?

2. Parties DIRECTLT involved in such a service/system?
   
   **PROBE: what are their interests?**
   
   a. Actors that could be involved in such a system
   b. Actors that could have a stake or be interested in taking part

3. Parties affected INDIRECTLY
   
   **PROBE: what are their interests?**
   
   a. Parties playing a role in the future

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b. New business opportunities that such a service or system will create

4. What kind of business model would you see as viable for implementing such a system?
   a. What would be the business case: how could banks monetize it?
   b. How do we align the parties?

PART 4: Cool-off
1. Ask the interviewee on his vision if such a service would be useful
2. Ask the interviewee if he would use such a service from his bank
3. Ask about the biggest challenge in implementing such a service/system

PART 5: Conclusion
1. Thank the interviewee for his/her time and knowledge sharing
2. Ask for feedback and questions
Appendix B: Human values (with Ethical Import) often implicated in system design (Friedman et al., 2006)

Table 1. Human Values (with Ethical Import) Often Implicated in System Design

<table>
<thead>
<tr>
<th>Human Value</th>
<th>Definition</th>
<th>Sample Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership and Property</td>
<td>Refers to a right to possess an object (or information), use it, manage it, derive income from it, and bequeath it</td>
<td>Becker [1977]; Friedman [1997b]; Herskovits [1952]; Lipinski &amp; Britz [2000]</td>
</tr>
<tr>
<td>Freedom From Bias</td>
<td>Refers to systematic unfairness perpetrated on individuals or groups, including pre-existing social bias, technical bias, and emergent social bias</td>
<td>Friedman &amp; Nissenbaum [1996]; cf. Nass &amp; Gong [2000]; Reeves &amp; Nass [1996]</td>
</tr>
<tr>
<td>Trust</td>
<td>Refers to expectations that exist between people who can experience good will, extend good will toward others, feel vulnerable, and experience betrayal</td>
<td>Baier [1986]; Camp [2000]; Dieberger, Hook, Svensson, &amp; Lonnqvist [2001]; Egger [2000]; Fogg &amp; Tseng [1999]; Friedman, Kahn, &amp; Howe [2000]; Kahn &amp; Turiel [1988]; Mayer, Davis, &amp; Schoorman [1995]; Olson &amp; Olson [2000]; Nissenbaum [2001]; Rocco [1998]</td>
</tr>
<tr>
<td>Autonomy</td>
<td>Refers to people’s ability to decide, plan, and act in ways that they believe will help them to achieve their goals</td>
<td>Friedman &amp; Nissenbaum [1997]; Hill [1991]; Isaacs, Tang, &amp; Morris [1996]; Suchman [1994]; Winograd [1994]</td>
</tr>
<tr>
<td>Informed Consent</td>
<td>Refers to garnering people’s agreement, encompassing criteria of disclosure and comprehension (for “informed”) and voluntariness, competence, and agreement (for “consent”)</td>
<td>Faden &amp; Beauchamp [1986]; Friedman, Millett, &amp; Felten [2000]; The Belmont Report [1978]</td>
</tr>
<tr>
<td>Accountability</td>
<td>Refers to the properties that ensures that the actions of a person, people, or institution may be traced uniquely to the person, people, or institution</td>
<td>Friedman &amp; Kalm [1992]; Friedman &amp; Millet [1995]; Reeves &amp; Nass [1996]</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Courtesy</td>
<td>Refers to treating people with politeness and consideration</td>
<td>Bennett &amp; Delatree [1978]; Wynne &amp; Ryan [1993]</td>
</tr>
<tr>
<td>Identity</td>
<td>Refers to people’s understanding of who they are over time, embracing both continuity and discontinuity over time</td>
<td>Bers, Gonzalo-Heydrich, &amp; DeMaso [2001]; Rosenberg [1997]; Schiano &amp; White [1998]; Turkle [1996]</td>
</tr>
<tr>
<td>Calmness</td>
<td>Refers to a peaceful and composed psychological state</td>
<td>Friedman &amp; Kalm [2003]; Weiser &amp; Brown [1997]</td>
</tr>
<tr>
<td>Environmental Sustainability</td>
<td>Refers to sustaining ecosystems such that they meet the needs of the present without compromising future generations</td>
<td>United Nations [1992]; World Commission on Environment and Development [1987]; Hart [1999]; Moldan, Billharz, &amp; Matravers [1997]; Northwest Environment Watch [2002]</td>
</tr>
</tbody>
</table>
# Appendix C: Communities of Practice and Their Values

<table>
<thead>
<tr>
<th>Community of Practice</th>
<th>Value</th>
</tr>
</thead>
</table>
| End - Users           | Awareness  
|                       | Support  
|                       | Anxiety  
|                       | Ease of use  
|                       | Usefulness  
|                       | Security  
|                       | Compatibility  
|                       | Image  
|                       | Social Influence  
|                       | Triability  
|                       | Visibility  
|                       | Trust  
|                       | Identification  
|                       | Authentication  
|                       | Access control  
|                       | Confidentiality  
|                       | Integrity  
|                       | Non-repudiation  
|                       | Availability  
|                       | System quality  
|                       | Service quality  
|                       | Perceived risk  
|                       | Attitude  
|                       | Privacy  
|                       | Personal innovativeness  
|                       | Performance expectancy  
|                       | Flow  
|                       | Payment instrument independence  
|                       | Configurable  
|                       | Cost-free |
| Store Executives      | Flow  
|                       | Profitability  
|                       | Visibility  
|                       | Flexibility  
|                       | Configurable  
|                       | Reliability  
|                       | Reach  
|                       | Standardization  
|                       | Compatibility  
|                       | Ease of integration  
|                       | Security  
|                       | Awareness  
<p>|                       | Data ownership |</p>
<table>
<thead>
<tr>
<th>Role</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Assistants</td>
<td>Ease of use, Ease of debug</td>
</tr>
<tr>
<td>Brick-and-Mortar Acquirers &amp; Payment Service Providers</td>
<td>Payment instrument independence, Compatibility, Flexibility, Ease of integration, Data ownership, Standardization, Configurable</td>
</tr>
<tr>
<td>Terminal and ECR Vendors</td>
<td>Connectivity, Standardization</td>
</tr>
<tr>
<td>Schemes</td>
<td>Standardization</td>
</tr>
<tr>
<td>Processors</td>
<td>Compatibility</td>
</tr>
<tr>
<td>Regulatory Bodies</td>
<td>Regulated, Privacy</td>
</tr>
<tr>
<td>Retail Banks</td>
<td>Ease of use, Cost-free, Flow, Security, Privacy, Trust, Configurable, Payment instrument independence, Standardization, Compatibility</td>
</tr>
<tr>
<td>Payment Institutions</td>
<td>Standardization, Compatibility</td>
</tr>
<tr>
<td>Specialized Software Companies</td>
<td>Standardization, Configurable, Flexibility, Ease of integration</td>
</tr>
<tr>
<td>Payment Consultants</td>
<td>Security, Acceptability, Standardization, Testable, Compliant</td>
</tr>
<tr>
<td>Software Developers</td>
<td>Openness, Programmable, Security, Payment instrument independence</td>
</tr>
<tr>
<td>MNOs</td>
<td>Connectivity</td>
</tr>
<tr>
<td>OEMs</td>
<td>Standardization, Compatibility</td>
</tr>
<tr>
<td>OEMs</td>
<td>Compatibility</td>
</tr>
</tbody>
</table>
Appendix D: Scenario Workshop Findings

This section presents the remarks raised by the consultants during the Scenario Workshop:

- An interesting topic to investigate further: are the retail banks allowed to provide customer identification services for 3rd parties like VAS Providers? Even industry experts are not sure yet.
- Why is the collection of coupons a consequence of a payment transaction? What about the option of browsing for coupons without doing a payment, like going on a website to find coupons for the products you will want to buy.
- While the retesting and recertifying of POS is more expensive, standardizing the POS is easier, but how are we going to standardize the interface between ECR and VAS provider? This is important for formatting the e-receipt and standardizing this for integrating with each Issuer.
- What about the case of more VAS providers, more Issuers?
- Visibility of the merchants in the app is very important
- Security of the connection between Merchant and VAS Provider, and between VAS Provider and Issuer: if sensitive data is sent, it should be a VPN because classic TLS could be broken, is more vulnerable. There needs to be a security assessment between the parties offering this service and see what kind of connection VPN vs TLS is needed there.
- Discussing about the Issuer storing or not the data it displays: consumer studies show that customers trust more the banks than any other parties for storing their receipts. Still, a contractual agreement for not selling/sharing the data would be good and would increase the consumer trust in banks.
- Availability of the data on the long term is higher if the issuer bank stores it, rather than just a VAS Provider, because of the bank’s continuity in service offering.
- Merchant app is not centralized, offering VAS in its app is only moving problem from wallet to phone because there are too many merchant each with its own app
- Different approach for receipts vs rewards
- Discussion about personalized vs generic coupons: since the consumer identity remains anonymous, the VAS Provider cannot offer personalized rewarding plans (e.g. birthday coupons). An option for having this could be inserted and the user could choose that by accepting that he has to share some data with the Merchant, which might be used to profile his behavior => personalized VAS with the associated risks and disclaimers
- Discussion about the trade-off: using your mobile phone for redeeming
- Use a barcode generated for the customer as an identifier for the VAS that do not need a high degree of personalization (e.g. weekly offers). This was already included in the VAS analysis as the membership card.
- Discussion on choosing the options at POS, where the Sales Assistant would ask you what and how much do you want to use, like at Air Miles
- Older ECRs are not prepared to handle new data elements: the less you touch the ECR, the better
- Small merchants do not have ECRs – solution replace ECR by iPads or mobile POS