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Innovating in Financial Services: The Development of a Rental Product

Master's thesis

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Ph.D

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TALLINNA TEHNIKAÜLIKOOL
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Finantsteenuste innovatsioon: renditoote arendamine

Magistritöö

Juhendaja: Priit Raspel
Ph.D

Tallinn 2025

Author’s Declaration of Originality

I confirm that I have independently prepared this thesis and that it has not been previously submitted for defense by anyone else. All works by other authors, significant viewpoints, and data from literary sources or other references used in the preparation of this thesis have been cited.

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Abstract

Innovating in Financial Services: The Development of a Rental Product

The goal of this master's thesis is to analyze and design a solution for the bank to develop a new rental service. To achieve this goal, the author describes the embedded finance market in the EU, analyzes the bank and its motivation to offer rental service, and represents the desired solution design and models.

In bank business analysis the author gives a general overview of the bank, its mission, business values, and Key Performance Indicators and conducts a SWOT analysis.

To understand the bank's motivation to offer rental service, the author conducts a business motivation model, describes the rental product concept, analyzes the value stream, and conducts a SWOT analysis for the rental product.

To describe the desired solution, the author analyzes the online onboarding process, creates processes and use cases, business service, and information model, describes functional and non-functional requirements, creates wireframes, and presents an architecture overview.

The objective of the thesis is achieved, and the outcome of the thesis solves the described problem of the bank.

The master thesis is in English and contains 71 pages of text, 5 chapters, 25 figures, 4 tables.

Annotatsioon

Magistritöö eesmärk on analüüsida ja mudeldada lahendus, mis võimaldab pangal arendada uue renditeenuse. Eesmärgi saavutamiseks analüüsib autor Euroopa liidu finantsteenuste turgu, viib läbi panga äri- ja motivatsiooni analüüsi, ja esitab soovitava lahenduse kavandi ja mudelis.

Panga ärianalüüsis annab autor üldise ülevaate pangast, selle missioonist, väärtustest ja peamistest võtmemõõdikutest. Lisaks viib läbi ettevõtte SWOT analüüsi, et hinnata panga tugevusi, nõrkusi, võimalusi ja ohte.

Panga motivatsiooni mõistmiseks renditoote arendamisel koostab autor motivatsioonimudeli, kirjeldab renditoote kontseptsiooni ning analüüsib selle väärtusvoogu. Lisaks viib autor läbi ka renditootele SWOT analüüsi, et hinnata selle nõrkusi ja ohte.

Soovitava lahenduse leidmiseks ja kirjeldamiseks analüüsib autor rendilepingu sõlmimise protsessi veebikeskkonnas. Autor kirjeldab selle protsessi ja kasutajalugusid, koostab äriteenuse ja äriinfo mudeli, defineerib funktsionaalsed ja mittefunktsionaalsed nõuded, loob kasutajateekonna visuaalsed kuvandid ja esitab lahenduse arhitektuurilise ülevaate.

Magistritööga sai täidetud selle eesmärk ja renditoote arendamine aitab pangal lahendada strateegilisi probleeme.

Magistritöö on kirjutatud inglise keeles, sisaldab teksti 71 leheküljel, 5 peatükki, 25 joonist, 4 tabelit.

List of Abbreviations and Terms

AI	Artificial Intelligence
APR	Annual percentage rate
B2B	Business-to-Business, involves transactions between two companies
B2B2C	Business-to-Business-to-Customer, the business sells products or services to another business, which then provides these products or services to the end consumer
B2C	Business-to-Consumer, the company sells products or services to the end consumer
BNPL	Buy Now Pay Later contracts
BPMN	Business Process Model and Notation
CCD II	Revised Consumer Credit Directive
EU	European Union
(e)POS	(Electronic) Point of sales
FURPS	A model for classifying software quality attributes (functional and non-functional requirements: functionality, usability, reliability, performance, supportability)
GMV	Gross Merchandise Value - Total value of sales
MVP	Minimum Viable Product
Open Banking	Financial services practice that allows third-party providers to access consumer banking information
RoE	Return on Equity
SIPOC	High-level process mapping of suppliers, inputs, processes, outputs, and customers
UML	Unified Modeling Language
(W)EEE	Electrical and Electronic Equipment (Waste)

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Introduction

In 2023 54 credit intermediaries and banks in the Estonian loan market had a total loan turnover of €907 million [1, p. 19]. This is about 2.3% of gross domestic product and the turnover per capita is roughly approximately €600. This highlights the significance of the credit market in Estonia's economy.

2023 was the year of record profits for European retail banks. However, as the bank that is analyzed in this thesis doesn't have Euribor-related loans in its portfolio, it's much harder to operate. Investors are afraid to invest in countries that have Russia as a neighbor. The deposit interest and loan losses have increased. And even though the small loan and hire-purchase interest is significantly higher in Estonia than in other European countries, banks's profitability is too low and this is not satisfactory for the owners or investors.

The goal of this master's thesis is to analyze and design a solution for the bank to develop a new rental service. To achieve this goal, the author describes the embedded finance market in the EU, conducts a business analysis of the bank, describes the bank's motivation to offer rental service, and designs and models a desired solution.

The master thesis was used as input for the development of the rental product. The analysis process started in February 2023. The rental product was launched in Estonia in September 2023.

The master thesis consists of the author's declaration of originality, abstract in English and Estonian, list of abbreviations and terms, list of figures, list of tables, introduction, 5 chapters, summary, references, and appendix of a non-exclusive license for reproduction, and publication of a graduation thesis.

The first chapter provides an overview of the Estonian consumer loan market and describes the master thesis's problem, its relevance, objective, phases, scope, used methodologies and their outcome, and the authors's role in conducting this thesis.

The second chapter gives an overview of the EU market and embedded finance sector, customer expectations, and rental providers.

The third chapter gives an overview of the bank's business values, strategic goals, and key performance indicators. SWOT analysis conducted for the bank is presented and analyzed.

The fourth chapter presents the result of the analysis of the bank's motivation to start offering rental product, product concepts, value stream, and capabilities as to why, whom, and how this product should be built. SWOT analysis conducted for the rental product is presented and analyzed.

The fifth chapter presents the desired solution design and models for the online onboarding flow of the rental product. The author conducted a SIPOC model, UML use case diagram, business service model, BPMN model, business information model, FURPS+ analysis, wireframes, and architecture UML component diagram.

1. Problem Statement

This chapter provides an overview of the Estonian consumer loan market, defines the problem, objective, and scope, and describes the phases of the master thesis. The relevance of the problem is explained, and an overview is given regarding the authors's role in conducting this thesis.

1.1 Estonian Consumer Loan Market

Consumer credit products are operating lease, capital lease, small loan, and hire-purchase. Only credit intermediaries and banks supervised by the Financial Supervision and Resolution Authority can offer consumer credit on the Estonian market. The number of providers in the Estonian market is 54 [1, p. 17].

According to an overview of the Estonian financial services market, in 2023 763,000 new consumer loans in the total amount of €837 million were issued to private individuals. In addition to consumer loans, private individuals used credit cards and overdrafts in the total amount of €639 million. Compared to 2022, the number of consumer loans decreased by 16%. At the same time, the average loan amount has increased by €635 from €1,725 in 2022 to €2,360 in 2023. The average amount of unsecured small loans and hire-purchase agreements was slightly over €800 at the end of 2023. In addition to the average loan amount, the annual percentage rate (APR) which includes interest rates and other fees, has also increased from 15% to 17%. For unsecured loans and hire-purchase, it was 21% at the end of 2023. [1, pp. 12,18]

At the end of 2023, the size of the loan portfolios of banks was €1.3 billion, and that of non-bank lenders was €274 million. The largest loan portfolios in Estonia belong to Swedbank Leasing (25%), SEB Leasing (16%), and Inbank Finance (13%). The total turnover of credit providers in 2023 was €907 million. [1, pp. 17-18]

1.2 Problem Description

Until the banking crisis in 2008, banking was particularly profitable. The effects of the crisis and stricter rules for granting credit significantly reduced banks' profitability, but along with the growth of Euribor in 2022, the profits of banks offering home loans have risen significantly. 2023 was the year of record profits for European retail banks. Southern Europe’s retail banking income increased by 27%, and Eastern Europe’s by 30%. Net interest margin increased from 1.8% in 2021 to 2.3% in 2023. 39 cents of every euro earned went straight to profit. The income per client in 2023 was €830 and €356,000 per employee. [2]

However, it is significantly more difficult for those banks whose portfolios do not have Euribor-related loans as for them the interest income is fixed. Bank costs increase every year due to new legal and compliance requirements, pressure to raise salaries due to high inflation, and the rise of operational costs. New neobanks and fintechs are constantly entering the loan market, to compete for the same customers. Therefore, if there is even a desire to keep the current market share, one must consistently invest in technology to stay competitive.

Investors' desire to invest in Russia's neighboring country has decreased. Deposit interest has increased, increasing the cost of money. This again hits these banks harder, which are not providing bank account services or home loans for customers. Loan losses have also increased, which also influences profitability. However, on the positive side, the average acceptable interest rates for small loan and hire-purchase in the Estonian market are significantly higher than elsewhere in the European Union [3, pp. 114-115].

In addition to the changes taking place in the market, the customers’ expectations of the products and services are also changing. Consumers want the freedom to use products and services conveniently and when they need them. It is important for them that service and product providers think about environmental impacts. More and more people want to reuse or rent instead of buying. There are already several good and popular rental options on the market (e.g., Netflix for entertainment, Bolt for transportation, Google Drive for software as a service, several apps for fitness, and many more). Banks, on the other hand, do not get a share of this profit today, because the services and products they offer do not have such flexibility.

The bank analyzed in the thesis isn't a traditional bank. It offers consumer loans but not home loans or bank account services. The biggest portion of the bank's sales come through embedded finance (loan and hire-purchase are provided to customers through its cooperation partners). This bank hasn't profited from the rise of Euribor, and the increase in deposit costs has directly reduced its profit. In 2023, its RoE was lower than other banks operating in the market. As the bank's strategic goal is to grow by expanding into new markets, it's clear that changes are needed to achieve these goals.

1.3 Objective of the Thesis

The objective of this master's thesis is to analyze and design a solution for the bank to develop a new rental service. To achieve this, the author analyzes the motivation and capabilities of the bank to build this new product to understand what type of solution would help the bank achieve its strategic goals. In the last part author designs and models the new solution processes and describes its requirements and architecture.

1.4 Phases of the Thesis and its Expected Outcome

To achieve the goal of the thesis, the following were carried out:

- **Market analysis**: The author gives an overview of the economic situation of the embedded finance sector in the EU market to understand if the rental product could have a good product fit.
- **Bank's business analysis**: The author gives an overview of the bank's business values, strategic goals, KPIs and conducts a SWOT analysis to understand if the rental product development will help the bank mitigate weaknesses and or threats.
- **Bank's Motivation and Capability Analysis**: The author analyzes the motivation for building the rental product, its concept, and value stream to understand if this will help the bank achieve its strategic goals, what capabilities need to be developed to be able to start offering this new service, who is the target customer, and conducts a SWOT analysis for the new product.
- **Desired solution description**: The author analyzes the desired solution for rental online onboarding flow by describing the process of the flow, and its use cases, conducting business information, and service model, listing functional and non-functional requirements, and presenting wireframes and architecture overview.

1.5 Scope of the Master's Thesis

The scope of the master's thesis includes:

- EU and Estonian embedded finance and rental market overview.
- Business analysis of the bank.
- Bank’s motivation and capabilities analysis.
- Design and models of the new desired solution.

The scope of the master's thesis does not include:

- Legal analysis.
- Technical analysis of the rental service.
- Overview of the security requirements and their implementation.
- Analysis of alternative solutions.
- Cost-benefit analysis as the costs for this development are not available.
- Overview of actual prototypes and designs which were used in the development process.
- Description of acceptance criteria and test cases as they don’t add value to this thesis.
- Realisation of the solution itself as this thesis is fully focused on the analysis.

1.6 Used Methodologies

This subchapter gives an overview of all the methodologies used in the thesis including references to the source showing based on what author decided how to apply them. Methodologies that were used:

- Secondary data analysis [4] to analyze the embedded finance and rental market in the EU and the expectations of the customers.
- SWOT analysis [5, pp. 179, 180] to understand the strengths, weaknesses, opportunities, and threats of the bank, and which are caused by the rental product.
- Motivation model diagram which uses ArchiMate's framework [6] to understand if and how the development of the rental product will help the bank achieve its strategic goals.

- Value stream analysis together with capabilities mapping [7] [8] to understand the value of rental flow, its outcomes, and capabilities that need to be developed to be able to launch the rental product.
- Lean canvas [9, p. 225] to analyze the concept of the new product.
- Persona analysis [10, pp. 683-690] to understand who the target customer for the new product is.
- SIPOC [11] to map the inputs and outputs of the online rental onboarding process.
- BPMN [12] to give a general overview of hire-purchase and rental product and a more detailed overview of the rental online onboarding flow.
- UML Use Case Diagram [13] to describe how customers and systems interact during rental online onboarding flow.
- Business Service Model based on motivation model and UML use case diagram to describe the rental online onboarding service and capability which it supports.
- Business information model [14] to describe in which tables data should be stored during the rental online onboarding process.
- FURPS+ [15] for analyzing the functional and non-functional requirements for the rental online onboarding flow.
- Wireframes [16] to have a simple visual representation of the rental online onboarding flow.
- UML Component Diagram [17] to model the high-level software components that support the rental online onboarding flow.

1.7 Relevance of the Problem

The bank desires to grow and expand. To do that, it has to become more profitable and attractive to investors. Even though a decision to build a rental product was already made before this thesis was conducted, it's still valuable to analyze whether, what, and how a rental product should be built to get confirmation that this cost of development is reasonable to achieve the bank's strategic goals. The problem of the thesis is relevant.

1.8 Author's Role in Preparing the Master's Thesis

The author of the thesis is working as a product manager in the bank analyzed in this thesis. In 2023, the author became the IT project manager of the rental product. At that

moment bank had decided to build this new product. The author's role was to figure out the concept of the new product, analyze the processes, describe the functionalities, coordinate different development units, and ensure that the product would be launched in the market by a strict deadline. The product was successfully launched in September 2023.

This thesis aims to provide a good overview of methods for analyzing new product developments from the idea phase until execution.

The reason for not naming the bank and writing the thesis in English is to keep this thesis open to the public. This way, other product managers would be able to gain new knowledge of the techniques that can be used to analyze potential solutions to help companies achieve their strategic goals.

The master's thesis has been compiled by the author alone using publicly available sources, which have been cited.

2 Embedded Finance Market in the European Union

This chapter provides an overview of the current EU market and embedded finance (including BNPL solutions) situation, describes the challenges of embedded finance, the potential market outlook, and customer expectations, explains why the rental model could be a good fit, and provides an overview of rental product providers on the market.

2.1 General Economic Situation

An important factor for those financers operating in the embedded market is the share of e-commerce as they offer their payment solutions also in online stores. The amount of e-shoppers has grown hand in hand with the growth of internet users. The share of internet users in the EU among individuals aged 16 to 74 is 93% and in Estonia 94% [18].

E-commerce share increased significantly due to the COVID-19 pandemic. From 2019 to 2020 the growth rate was 29% and from 2020 to 2021 12% [19, p. 20]. The share of e-shoppers in the EU in 2024 among individuals aged 16 to 74 was already 72% and in Estonia 73% [18]. According to Mastercard's prognosis, e-commerce is expected to represent more than 20% of total sales volumes ($8.1 trillion) by 2026 [19, p. 21].

The unemployment rate in the EU region has been declining since 2013. In 2013, the unemployment rate in the EU region was 11.7%, but in 2022 it dropped to 6%, where it has remained until now [20]. In Estonia, the unemployment rate declined from 2010 to 2019 from 12,3% to 4,4% and then increased. In 2024 it was 7,4%. [21]

The rising interest rates have reduced spending in some areas like luxury goods, but overall the strength of the labor market has supported the European economy [22, p. 6]. In Estonia, household consumption has declined since the second half of 2022 and household confidence is the weakest among the EU countries [23, p. 1]. Together with the consumption also the borrowing has decreased. In 2024 compared with 2023 21% fewer new consumer loan contracts were signed in the first half of the year than in the first half of 2023 [24, p. 12].

2.2 Embedded Finance Current State

Embedded finance has a significant impact on point-of-sale (POS) turnover. Customers are offered flexible payment solutions interwoven with user-friendly and fast processes either in a physical brick-and-mortar shop or in a webshop at the checkout.

The benefit of embedded finance for the customer is the possibility of getting financing at the exact right moment, with the possibility of spending more and being able to use the product or service instantly after signing the credit agreement. Merchants get a payout from the finance provider upfront without the need to gather payments from customers or deal with debt management. McKinsey's 2021 research found that buyers would spend 20 percent more from suppliers' websites if the financing option were available [25].

Embedded finance importance is compared with consumer loans and credit cards in 6 EU countries is shown in Figure 1. Surprisingly, credit cards are the most popular means of finance only in the UK, followed by consumer loans and embedded finance. Personal loans are the most popular financing means in Germany, Italy, and France, followed by credit cards and embedded financing. In Poland and Sweden, embedded financing comes second after consumer loans.

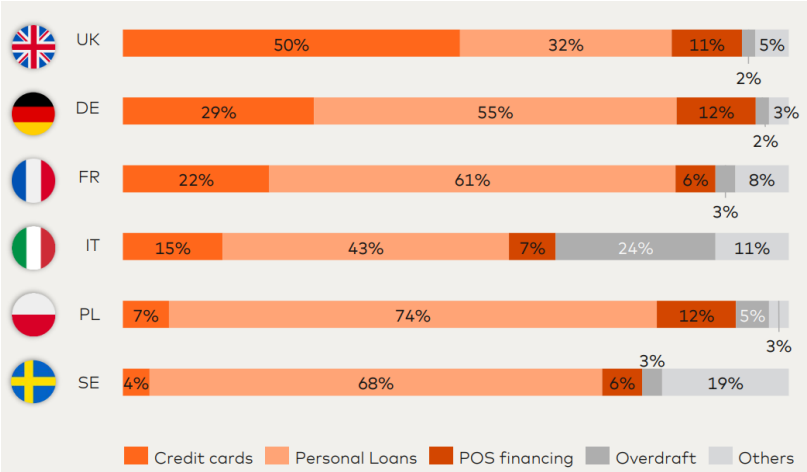


Figure 1. Product Mix by Market (2022) [19, p. 9].

Data from the first half of 2024 indicates that in Estonia consumer loans are the most popular form of financing (€384 million issued in the first half of 2024). This is followed closely by credit cards (€328 million) and overdrafts (€23 million). [24, p. 12]

In recent years in addition to traditional embedded finance offering „Buy now, pay later“ (BNPL) has gained a huge success. Interestingly most of the BNPL providers are not banks (e.g., Klarna, Afterpay, Affirm, Splitit, Sezzle [28]) as only one of four BNPL offers comes from a bank [19, p. 16].

BNPL allows customers to delay payments without paying any extra fees like administrative, contract fees, or interest. According to Mastercard’s market research, more than 50% of EU customers have tried it. 50% have used it to buy electronics and 40% for home improvements [19, pp. 16-17].

BNPL's growth was heavily supported by the growth of e-commerce. From 2016 to 2023 BNPL's share from e-commerce sales grew 8% from 2% to 10% [25]. It appears that if the BNPL payment option is available at the checkout then the sales have grown 20-30% [26]. In Estonia, the sales growth of e-commerce merchants affected by BNPL availability on the websites is 15-35% based on the info shared by embedded finance provider Modena [27].

Since the financiers do not ask for additional fees in the case of BNPL, it is not considered a credit product. Therefore, the financers are not obligated to ask for the client's income or liability information or check its validity. This means that compared with traditional products it is almost effortless to use and due to that this is attractive to young customers as a good instrument for managing cash flows [19, pp. 20-21,32].

2.3 Embedded Financing Challenges

Financers who don’t have home loans in their portfolio face much lower profitability compared with traditional banks. In 2023 financiers faced the biggest increase in costs in the past 16 years [2]. In addition to increasing costs and the cost of money, competition is getting more intense. Because of this, embedded finance providers are forced to pay bigger commissions to merchants who offer their products to customers and it also worsens the checkout experience for the customers as there are too many payment options to choose from [19, pp. 30, 34 - 36].

In October 2023 European Council approved the new version of the Consumer Credit Directive (CCD II) which will take effect at the end of 2026 [29, p. 11]. This document aims to protect customers from harmful credit lending, especially in online environments.

The directive enforces stricter rules on the lending processes and advertising. Additionally, this directive will extend in the future also to loans under the amount of €200 and BNPL contracts. [30] This means that BNPL will be regulated as other credit products. [19, p. 39] [31, p. 14]

Possible changes to CCD II began to be discussed as early as 2022. As a result, investors in BNPL companies became concerned about potential future returns. In the same year, Klarna's (a leading global payment and shopping service) value dropped from $45.6 billion to $6.7 billion, while costs nearly doubled [19, pp. 30, 34, 35].

The directive is supported by various sources highlighting the harmful impact of debt on individuals and the economy. Over-indebtedness significantly increases the likelihood of poor health, as creditor actions to collect unpaid debts when customers fall into arrears often lead to financial depression. Interestingly, non-mortgage debts have the most severe impact on health. Policymakers are also aware of the economic costs of inaction. Currently, one in four Europeans (132 million) suffer from mental health issues, costing each household over €2,200 per year. [31, p. 12] [32] [33, pp. 209, 223] [34, pp. 24, 25]

2.4 Embedded Finance Forecast

The demand for consumer credit will also exist in the future, although how customers prefer to use it may change so there is a significant opportunity and need for innovation [19, p. 49]. Consumer lending will remain profitable, especially in the Baltics where customers bear the highest interest rates. However as customers are willing to accept them, credit providers are not motivated to lower the rates. [3, pp. 114-115]

When looking at the growth perspective then embedded finance industry leaders expect credit volumes to continue to shift toward embedded lending. According to the McKinsey forecast embedded finance revenue in Europe could exceed €100 billion by the end of the decade and become the key driver of customer acquisition. [25] Regarding BNPL providers it is expected that bigger financers who are better positioned to handle economic challenges and future credit regulations and who have access to deposits will probably absorb current providers. Adjustments still need to be made to improve BNPL's profitability. [19, pp. 30, 34, 35, 49]

As mentioned before young customers are hesitant to take credit products as they are frightened of being declined or not sure that they will be successful in managing it [19, p. 49]. Controversially in the Estonian loan market even though younger customers are more aware of the risks, they have a favorable attitude toward lending as opposed to older customers who are less informed, but much more cautious when taking a loan [3, p. 115].

When designing new solutions, it is important to consider their user-friendliness. Customers must be able to do everything comfortably on their smartphone, and at the same time, flows must be fast and convenient. From 2008 until 2023 smartphones sales have grown from 139 million units to 1.39 billion units [35]. When comparing different interaction channels that banks provide, mobile is getting more and more popular and will continue to stay the most dominant one as shown in Figure 2.

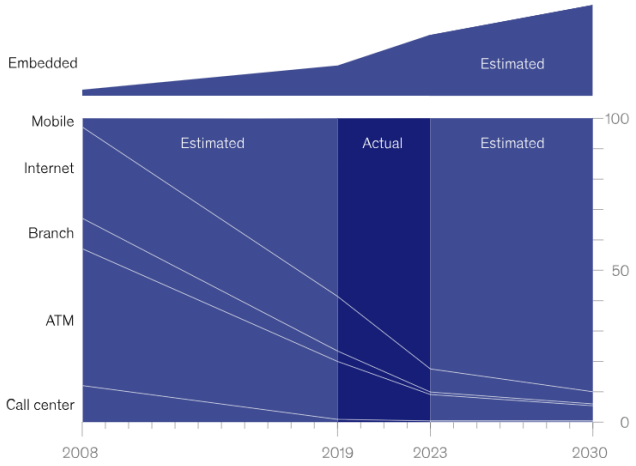


Figure 2: Retail Customer Interaction by Channel (%) [25].

Traditional application processes and approval times will not be sufficient in the future. To stay competitive and keep their customers, financers must ensure immediate decision-making and high approval rates. Open Banking and AI will be the key which will help to deliver faster and more reliable credit decisions and transform processes [19, pp. 44, 45]. Customer-centric strategies and data-driven decisions will exhilarate the boost of sales. McKinsey's article from 2021 highlights that companies could benefit from it from $1.7 trillion to $3 trillion [36].

2.5 Push for a More Green Approach

In addition to the challenges mentioned before customers are more eager to make ethical choices and expect that the financers would also take part in building a better planet [2] [19, p. 46].

One of the fastest-growing waste streams in the EU is waste electrical and electronic equipment (WEEE) (smartphones, tablets, laptops, etc.). In 2021 13.5 million tonnes of these devices were released in the EU market (11 kilograms per person), but only 4.9 million tonnes were collected [37]. Growing WEEE is the result of high consumption, short lifecycle, and few repair options [38, p. 14]. Not only is WEEE bad for the customer's health, but if recycled then it contains important materials that support the EU's strategic autonomy [39].

Old devices are kept at home to have a backup, due to emotional attachment, data security concerns, or lack of recycling options [40, p. 8]. According to a study conducted by Deloitte in 2017 (53,000 respondents, 31 countries), only 16% of respondents gave away or sold their old smartphone [41, p. 17].

Second-hand electronics is a profitable opportunity in the EU market. The market needs providers who are ready to make an attractive offer to both customer groups – the ones that want to give their device for resell or recycling without too much hustle and the ones that want to support the second-hand market by purchasing used products. A good trade-in solution would keep customers upgrading their devices yearly at the same merchants and reselling the used devices.

An example of a company that has turned the second-hand market into a success is Refurbed online marketplace for refurbished electronics. This was founded in 2017 in Austria. Its gross merchandise value (GMV) reached €1 billion by 2023. Series C funding brought the company €115.8 million in total investment. [42] Merchants who cooperate with these types of companies like Refurbed can turn old devices into new potential income streams and grow a loyal customer base with less effort [40, p. 132].

2.6 Rent Model

An alternative to offering attractive trade-ins to keep customers loyal and generate an additional income stream is the product-as-a-service model, aka rent or subscription. Instead of buying products, customers rent, lease, or pay per use, which has a better margin for the merchants than a one-time sell deal. In addition to paying for the use, customers are offered bundled services (e.g., insurance, and repairs). On the negative side rental companies need to deal with credit checks, insurance, maintenance, and product returns which is adding an extra layer of complexity and cost. [36] [43] [44, p. 5]

McKinsey & Company's 2018 research revealed that the rental e-commerce market grew by over 100 percent between 2013 and 2018 with sales rising from $57 million in 2011 to over $2.6 billion in 2016 [36]. Research conducted by Riverty (a FinTech company offering innovative financial solutions in 5 countries in the EU) also confirms that more and more customers prefer using to owning [44, p. 5].

Kearney's 2023 research (5,000 respondents, five countries) confirmed that flexibility of cancellation and bundled services (repair, maintenance) would make tech rental attractive for customers. However, only 10-15% of respondents were open to renting, probably because this is still a new concept in the market, as shown in figures 3 and Figure 4.

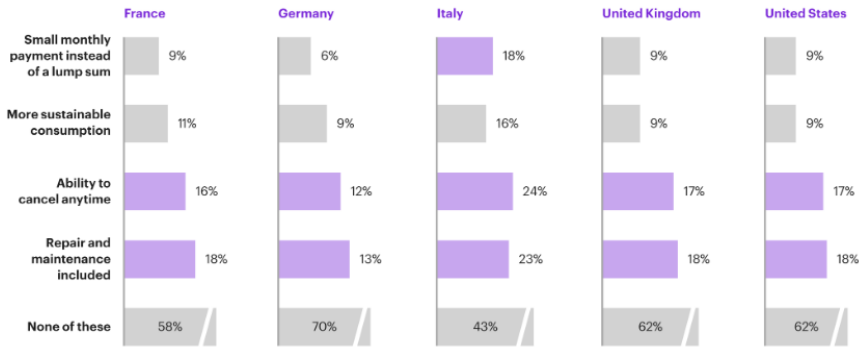


Figure 3: Reasons Important When Considering Renting an Electronic Product [43].

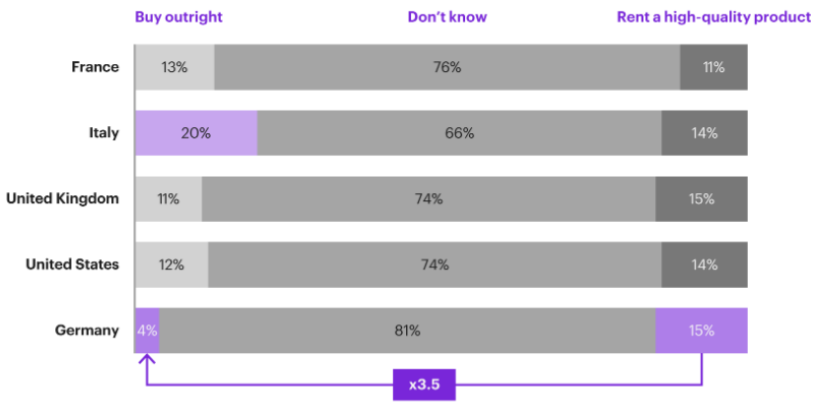


Figure 4: A Preference for Renting High-Quality Electronic Product [43].

Additionally, it might be that customers are afraid of hidden fees and problems when returning the rental devices. Also, they are not that good at calculating all the possible upcoming fees upfront so misleadinly they might think that owning in the long run is less expensive. [43]

When analyzing the Estonian market then renting is not as popular as owning. The population census from 2022 revealed that more than half of Estonia's population (689,204 people in total) live in a flat in a city and the share of people renting a dwelling is only 18.3% [45]. Estonia is amongst the EU countries with the highest motorization rates: 630 passenger cars per 1,000 inhabitants compared to the EU average rate of 570 cars [46].

The Consumer Choice Center evaluates 60 cities worldwide based on their friendliness toward sharing economy services, including ride-hailing, flat-sharing, e-scooters, and fintech innovations. In this assessment in 2023, Tallinn got the 29th position sharing the rank with cities like New York City and Munich. This indicates that Estonia offers a variety of sharing opportunities, but this is not as good a level as Lithuania or Brazil which has more supportive environments for sharing economy platforms. [47, pp. 2,4,5]

It is important to note that CCD II does not apply to rental products where the customer does not have the option to become the owner of the product after the end of the rental agreement [48, p. 15]. Also renting helps to reduce waste as the lifespan of the product is longer and customers can only use what and how long they need [43]. This means that the only opportunity to offer Estonian customers an easy and quick crediting process is to start offering rental product.

Even though data regarding the willingness to rent is controversial, the global mobile phone rental market size was valued at approximately $3.5 billion in 2023 and is projected to reach around $8.7 billion by 2032. A major growth factor influencing the mobile phone rental market is the rising adoption of high-end smartphones. With the continuous evolution of smartphone technology, consumers are eager to use the latest models without the financial burden of purchasing them outright. This desire for the latest technology, coupled with the high cost of top-tier smartphones, makes renting an attractive option. The rental market provides a cost-effective solution for consumers who want to stay updated with the latest devices without significant upfront costs. [49]

2.7 Tech Rental Providers

The bank analyzed in the thesis had decided to start offering rental services in the EEE (Electrical and Electronic Equipment) sector to individual customers with a merchant selling smartphones, laptops, smartwatches, and computers.

Therefore, the author analyzed only companies offering rental services for these devices in the EU: Grover, Topi, and Wiserentr.

When analyzing the offerings of these companies then all of them pointed out that renting tech devices keeps the overall costs lower, allows regular upgrades for the tech, devices can be covered with insurance, and this is an eco-friendly solution as always devices are either sold or recycled. Customers have flexible cancellation and return policies. These companies take care of the entire device lifecycle (payment collection, contract management, repairs, upgrades, and remarketing of devices). [50] [51] [52] Table 1: Comparison of Companies Grover, Topi, and Wiserentr (compiled by the author based on) gives an overview of these companies and their offering in the rental market.

Table 1: Comparison of Companies Grover, Topi, and Wiserentr (compiled by the author based on [50] [51] [53] [52] [54] [55] [56] [57] [58]).

Company	Grover	Topi	Wiserentr
Founded (when, where)	2015, Germany	2021, Germany	2021, Spain
Operating countries	Germany, Austria, Netherlands, Spain, and the United States.	Germany	Spain

Business model	B2C: Offers rent directly to customers	B2B: Offers rent to companies	B2B2C: Offers rent to customers through merchants
Success metrics	Has rented more than 1.2 million devices and raised €1.4 billion in funding.	Has raised $50 million in funding.	Has raised €1.6 million in funding.
Products that can be rented	Smartphones, laptops, and gaming consoles	Wider range from smartphones, and printers to robotic arms and industry-specific machinery	Smartphones and laptops
Competitive advantage	* Wide range of tech products available for rental. * Flexible rental plans. * Devices are covered with a warranty. * In addition to damage protection quick replacement service is offered.	*Offering for B2C is unique. *Automatic and real-time decisions for companies. * Business liquidity is protected and the option to take advantage of tax-deductible as rent is an operating expense. * Employees don't have to work with outdated equipment.	None compared with Grover

2.8 Conclusions

This chapter provided a brief overview of the current EU market situation and embedded finance (including BNPL solutions), described the challenges of embedded finance, the potential market outlook, and customer expectations, explained why the rental model could be a good fit, and gave an overview of tech rental product providers on the market.

The economic environment is favorable to embedded finance, as customers continue to have strong purchasing power and desire to buy. The e-commerce sector has grown immensely, and embedded financing solutions will continue to grow in its wind. It is expected that customer financing will move from direct lending to embedded as more and more customers want to use the credit exactly at the moment when they need it.

Even though customer lending is a profitable field it needs extensive investments to stay in the competition and be able to navigate with stricter legal requirements and intense

competition. It's crucial to use the potential of AI and Open Banking and good design to keep the application process frictionless, quick, and easy.

Moreover, customers want to see that financers also care about our planet. There is a huge growth potential in the trade-in, recycling, and rental field. Success lies in offering customers the option to use second-hand devices or an easy option to send their used devices to recycling.

A growing trend is renting tech devices. Renting is a good option for the environment and customers who can now use only what they need for how long they need it. By offering rental merchants can more easily grow a loyal customer base and establish a new revenue stream. When analyzing other tech rental providers it appears that there are only a few providers in the market which means that there is a huge growth potential.

In conclusion, this chapter supports the bank’s idea to start offering B2B2C tech rental in Estonia and at a later stage in other countries in the EU. The next chapter aims to analyze the bank’s strategy and capabilities to understand if offering rent would help the bank to achieve its strategic goals and what is exactly needed to build this new product.

3 Bank’s Business Analysis

In this chapter, the author gives an overview of the bank by describing its business values, strategic goals, and the key performance indicators (KPIs) used to measure whether they are successfully fulfilled. The author then analyzes the bank using a SWOT methodology and suggests her ideas regarding mitigating weaknesses and threats.

3.1 General Overview of the Bank

The bank under analysis collects deposits and offers various consumer financing options in multiple European markets. The bank offers B2C financing on its website and B2B2C financing through thousands of merchants.

The bank’s main mission is to help its partners provide the best possible shopping experience for their customers. Merchants offer bank financing options to private customers at their point of sale and/or in their webshops. Merchants' webshops are integrated with the bank’s self-service so customers can independently submit credit applications and sign contracts to finance their purchases.

The bank’s business value for customers is that they can use hire-purchase or loan to pay for the product or service when they lack the funds or are reluctant to pay the bulk amount immediately. Business value for merchants is that with the help of easy, seamless, and fast financing, they can thrive on their sales as right after the financing contract is signed they get payment from the bank. Internally bank focuses on profitability and scaling.

An overview of the bank's strategic goals and KPIs which are used to measure them can be found in Table 2. Bank’s Strategic Goals and Most Important KPIs (compiled by the author).

Table 2. Bank’s Strategic Goals and Most Important KPIs (compiled by the author).

Strategic goal	KPIs
Profitability and efficiency	Net profit RoE GMV

	Cost/income ratio
Customer acquisition and retention	Number of active contracts Number of new contracts Number of customers
Growth by boosting sales	Loan portfolio increase % Total income increase % Active partnerships
Portfolio quality	Impairment losses
Expansion	Operating countries
Sustainability	Green finance volume

3.2 SWOT Analysis of the Bank

A SWOT analysis was conducted to point out the bank's strengths, weaknesses, opportunities, and threats. This gives a good overview of the bank's position and internal and external factors that potentially influence the bank and analyzes the actions to mitigate the weaknesses and threats. This analysis is derived from publicly available information about the bank and the author's knowledge. The outcome of the analysis is presented in Figure 5.

Figure 5. Result of SWOT Analysis of the Bank (compiled by the author).

From the strengths perspective bank has **strong product engineering capability**. Development teams are efficiently using the best practices of agile development. Releases are happening daily without downtime. When a released code is causing errors, quick rollbacks are done so there are few incidents with low impact on the overall profitability or sales. The bank has a **known brand**. As the bank has operated for a long period it has good experience in executing marketing campaigns in different channels to drive customer acquisition and build brand awareness. Bank **products are offered by thousands of merchants** through **mature online and offline channels** in many European countries and this is supported by **strong sales management**.

The bank has **effective risk and compliance management**. Even though the environment where the bank operates is highly regulated, the underwriting risks are mitigated smoothly, yet still, bank **applications have a high acceptance rate**, a **high rate of automated decisions**, and **low impairment losses**. The bank has **access to deposits** to

guarantee solid funding. The bank has **clear objectives and key results defined** for all teams. Employees have a clear understanding of the expectations. **Flat structure and decentralized decision-making** ensure that decisions are done quickly and at as low a level as possible which helps bank to make improvements quicker.

From weaknesses, it is worth mentioning that there is **too high dependence on merchants** as the proportion of direct lending is only 15% of all sales. There is a good design system in place, but **not a team that would focus on a customer-centric design**. Due to lower RoE compared to competitors in the market and high operating costs, it's **difficult for the bank to raise additional capital**. Bank has high knowledge of the Baltic market, but **not about other markets in the EU** so it sets additional costs and impediments when starting to operate in new countries. The bank is focusing on **too many strategic initiatives** in parallel which makes it hard for the product team to keep up. As banking is highly regulated then scaling to other countries in the EU has **lots of constraints** and it needs huge investments. Even though generally decisions are made at a low level, some **strategic decisions lag** (e.g., decisions regarding closing nonprofitable products). Bank has **high operating costs**.

Opportunities for the bank lie in **adopting a customer-centric design approach** and **adopting better cross-sell and upsell strategies**. Both of these would help to build stronger acquisition and retention reflecting on sales growth. A potential unused opportunity is **offering a rental service**. This is supported by the evidence from the growth of green energy financing GMV and the success stories of other rental providers. When taking into account the total addressable market in all operating countries the bank **has room to grow** also in the current ones if it could provide something new or more suitable to the customers compared with current providers in the market.

Yearly there are about 0.5 million unique customers who apply for different products. If the bank would focus more on making this easier for them and making more tailored **offers directly through B2C channels** where acquisition cost is lower, it could contribute highly to sales and profit. **New technical solutions in the market** offer opportunities for even better and quicker financing solutions. The bank has a dedicated team for growth and business development who are identifying and pursuing new growth potentials both in the operating and in the new markets.

From threats, it is worth mentioning **economic uncertainty**. In the operating countries, there is high competition in the labor market which poses constant **pressure to raise salaries** not **to lose talent**. **New regulations** pressure bank to constantly invest in risk and compliance management. **Competition in the market is stiff** and this is growing the costs as merchants expect higher premiums from the bank to provide its products to customers. As the bank is rapidly developing new solutions then there are some **technical debt and security issues**.

Actions to mitigate threats and weaknesses:

- Strengthening the B2C product line.
- Investing in a customer-centric design approach.
- Decreasing operating costs.
- Putting more development effort into products that have higher profitability.
- Hiring talents outside Baltic countries.
- Prioritizing only the most critical objectives alongside profitability growth.
- Assessing their product portfolio systematically to decide which products to keep, grow, or kill.
- Strengthening financial resilience through going public or issuing bonds.
- Using technological possibilities to scale without the need for new employees.
- Investing in employees' growth and engagement and strengthening its culture.
- Strengthening the compliance and legal support for development teams.
- Investing in risk and compliance management.
- Strengthening their offering with products and features that merchants miss who are offering their products.
- Offering live chat option for merchants and customers.
- Allowing product teams to build high-quality products with proper architecture.
- Simulating cyberattacks to simulate potential vulnerabilities.

3.3 Conclusions

The bank that is analyzed is mature and operating well. Strong product engineering capability, a wide range of merchants offering the bank’s product, strong sales management, and effective risk and compliance management all support developing a new rental product. Also, the opportunities support this as customers have an interest in

new solutions that would be sustainable and there is evidence that the trend is moving from owning to using. Additionally, rental products with higher profitability compared with hire-purchase contribute to the bank's aim to achieve higher profitability.

4 Motivation, Value, and Capabilities Analysis

This chapter aims to understand the motivation why the bank should offer rental product and what capabilities need to be improved or developed to achieve this. For this author uses the motivation model, lean canvas, persona mapping, BPMN, SWOT, and value stream analysis. Also, the role of the author in executing this project will be described.

4.1 Motivation to Build Rental Product

To understand if building a rental product will help the bank achieve its strategic goals the author conducted a motivation model (**Error! Reference source not found.**As visible in the model, the rental product is expected to help grow sales and profit and support sustainability.

Assessment of the rental product reveals that as rent is a non-credit product its onboarding flow can be simpler and quicker for the customers. Rent acquisition cost is considered to be lower as there are very few rent providers for high-end consumer electronics verticals in the EU market (none in Estonia). So if customers want to rent other products or rent again a new device after returning it they will rent it from the bank. Rental gives a good opportunity for upselling and cross-selling (e.g., offering rent also for a smartwatch when a customer rents an iPhone, and offering insurance coverage and maintenance with every rental). This means that rental products should help to sell more and with a bigger profit.

Not only are tech-selling merchants forced to start offering more sustainable solutions, but this is also expected by the customer. The trend towards renting is getting more popular which is reflected by the success of different vertical rental providers (cars, series streaming, etc.)

The goals for a rental are to have a high retention and conversion rate, boost sales and profit, start offering rent through one partner who sells high-end tech devices, and then expand the offering to other merchants and verticals where rent isn't present or where bank's offering can be stronger. Rent will be a new way for the bank to show that they care about the planet in addition to current green financing.

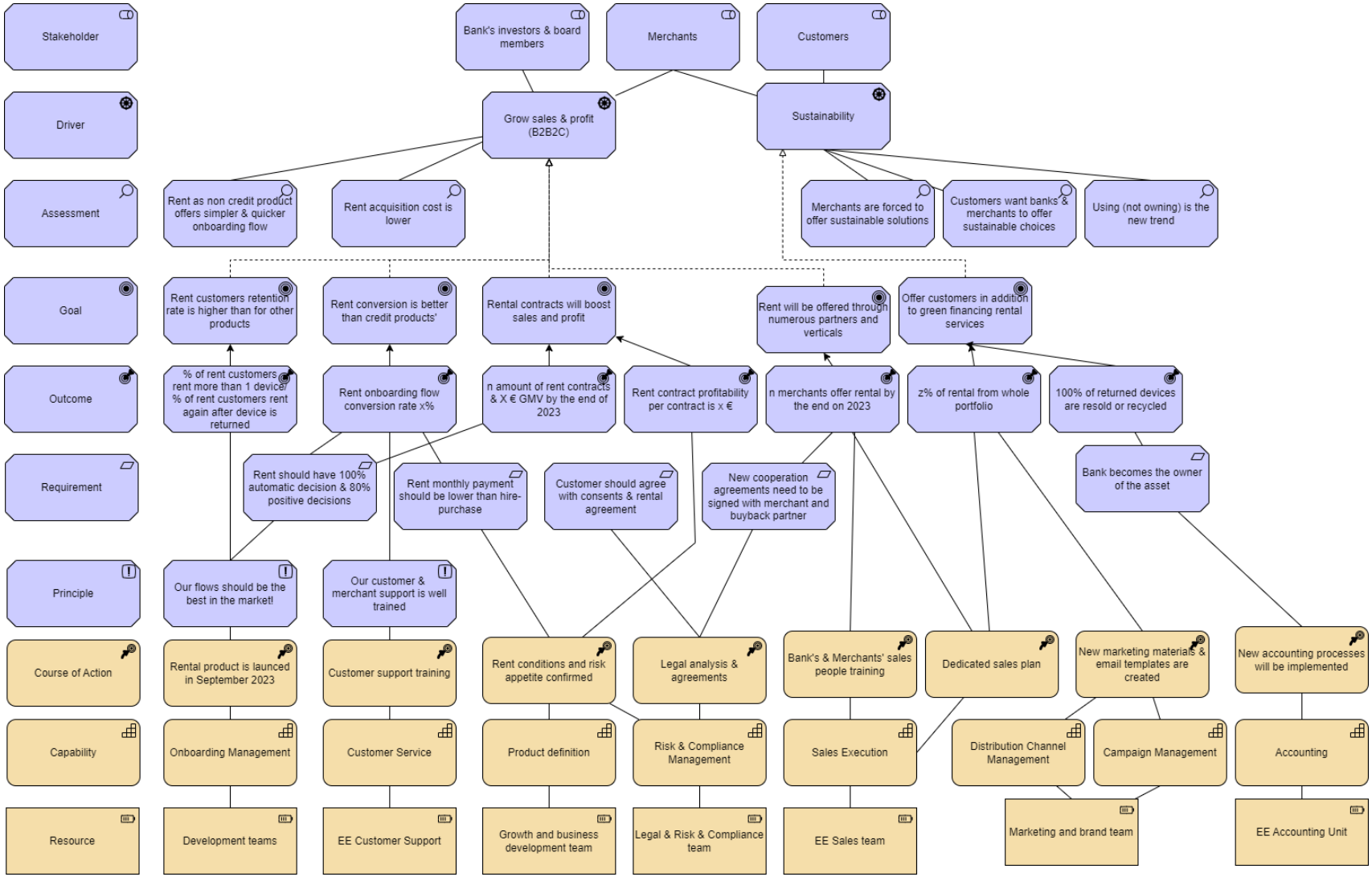


Figure 6. Motivation Model for Providing Rent (compiled by the author).

4.2 Rental Product Concept

To understand in more detail the expectations and requirements for the new product the author conducted a workshop together with the growth team to create the lean canvas (Figure 7) that describes the general rental product concept.

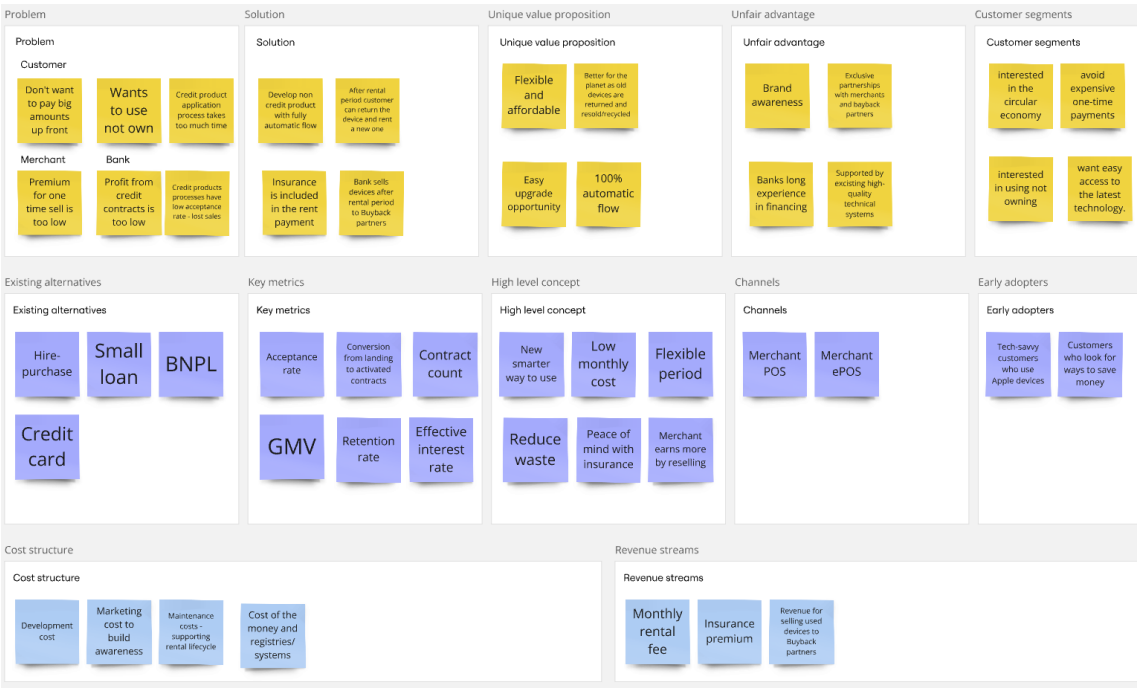


Figure 7. Rent Lean Canvas (compiled by the author).

Analysis showed that rental might be a significant opportunity and the bank wants to be a forerunner in introducing a new non-credit product. By offering rental the bank wants to offer customers low payments, and seamless onboarding. Merchants have the opportunity to grow sales together with the bank by attracting new customer segments and reselling used devices. Compared with hire-purchase, rental is expected to have a higher profitability and retention rate.

To understand who is the target customer author created a persona map of a potential customer who wants to rent a new product (v1 Figure 8) and a customer who wants to buy the returned device (v2 Figure 9. Persona Map of a Potential Rent Customer v2 (compiled by the author). The target customer v1 values sustainability. It is important for her that the products that she uses would be convenient and would not use too much of her free time. She values being trendy, but it is sometimes too expensive for her. She believes that credit products should be avoided. The target customer v2 values good deals.

He believes that buying a new device would not make sense as it is too expensive, but on the other hand, wants to get a good quality device with a warranty. He believed that using used devises is good for the environment.

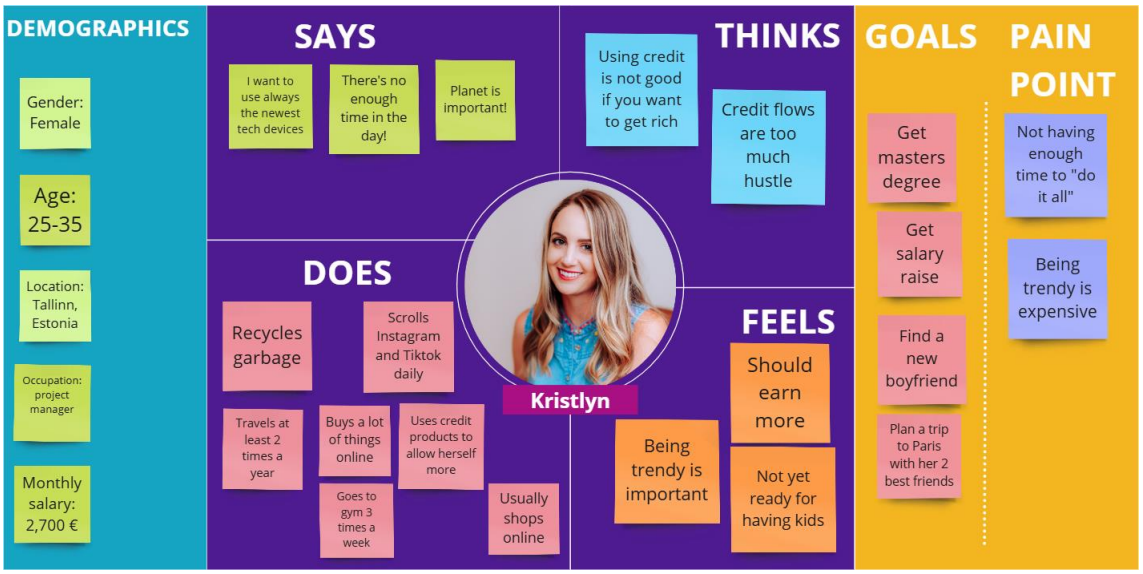


Figure 8. Persona Map of a Potential Rent Customer v1 (compiled by the author).

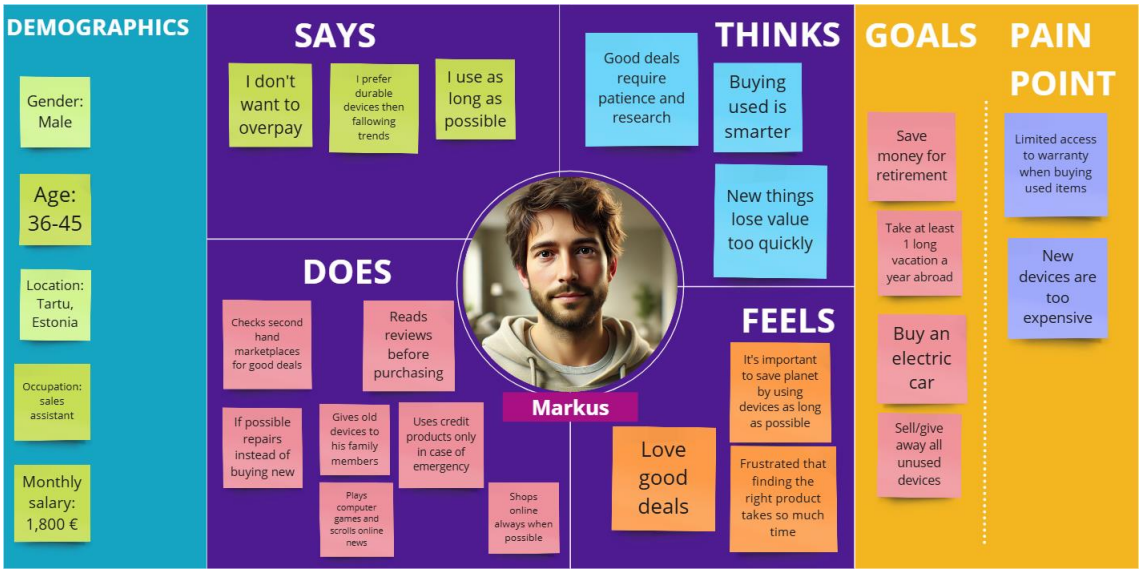


Figure 9. Persona Map of a Potential Rent Customer v2 (compiled by the author).

This exercise confirmed that rental should be offered in online channels as a trendy noncredit opportunity where new devices can be used at low cost at the same time saving the planet and customers' time. Used devices should be offered to those customers who value good products, but don't consider being trendy more important than a good deal.

The author captured the results from lean canvas and persona mapping to a product concept overview table (Table 3. Product Concept Overview (compiled by author).. This

helped the author, other stakeholders, and development teams to understand the value of building this new product for the bank, merchants, and customers.

Table 3. Product Concept Overview (compiled by author).

Vision	Become a leading provider of sustainable and profitable rental service for high-end tech devices.
Mission	Design and launch an innovative non-credit rental product that meets wider customer segment needs, enabling bank and our partners to grow sales and profitability.
Objective	Develop a rental product that generates a new steady revenue stream for the bank and merchants. Rental onboarding flow should be best in the market by offering frictionless flow and fully automatic decisions.
Why? Whom?	**Attractive opportunity**: Rental is believed to be the next big opportunity, and the bank wants to be a forerunner in offering this product. **A favorable regulatory landscape**: A non-credit product flow is simpler and quicker than a credit product. **Enables to attract new customer segments**: e.g., customers interested in the circular economy, innovators, and early adopters who have easy access to the latest technology.
Competitive advantage	**For the customer**: **Seamless, quick, and user-friendly process**. **Easier onboarding**: Less data needs to be provided by the customer (e.g., no need for an account statement). **Low monthly payments** due to residual value which is guaranteed by the buyback partner. **No need to deal with selling** as after the rental period ends, the customer returns the device. **For the merchant**: **Attract new customers.** **Increase conversion** with easier and faster journeys. **Maximize earnings** throughout the lifecycle, enabling upselling, cross-selling, and increased retention. **Win the secondary market** by refurbishing, reselling, and renting devices in the rapidly growing second-hand market.

4.3 Hire-purchase and Rental Product Online Onboarding Value Streams and the Capability Analysis

The bank's most important goal is to create value for its customers, merchants with whom it has cooperation agreements, and for the bank’s investors and board members. To achieve this, the bank executes numerous value streams. One of them is the onboarding value streams for signing an agreement and becoming the bank’s customer.

The author decided to analyze online onboarding as she was a member of the development team that executed the online onboarding flow in electronic point of sales (ePOS). Online onboarding was one of the most important parts of the minimum viable product (MVP) that needed to be launched in September 2023.

Rent's onboarding flow and value stream are most similar to the hire-purchase value stream. Due to that author analyzed both products' value stream and capabilities which supports them in understanding what capabilities the bank needs to develop and what processes to change to be able to launch the new rental product.

Firstly author compared hire-purchase and rental full flow using a simplified BPMN (Figure 10 and Figure 11).

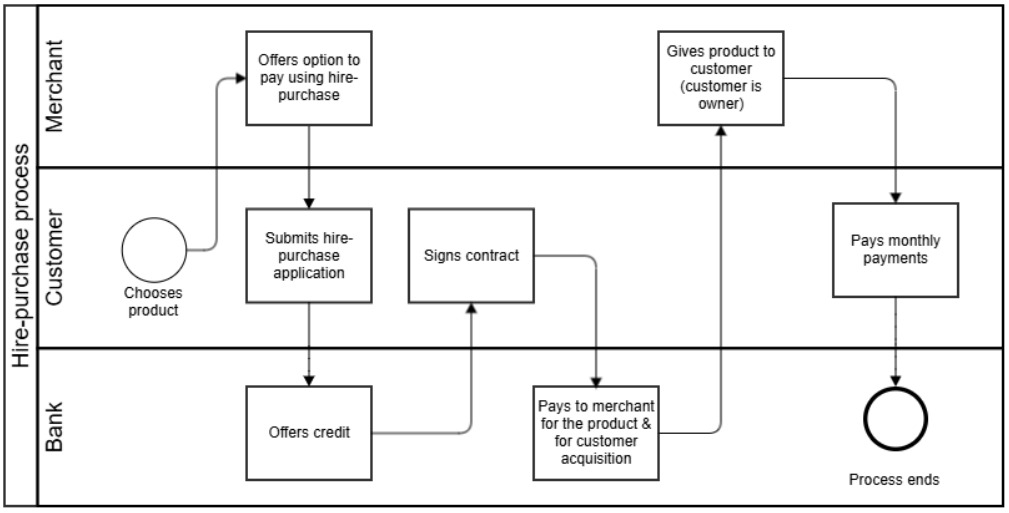


Figure 10. High-level process of Hire-purchase Product (compiled by the author).

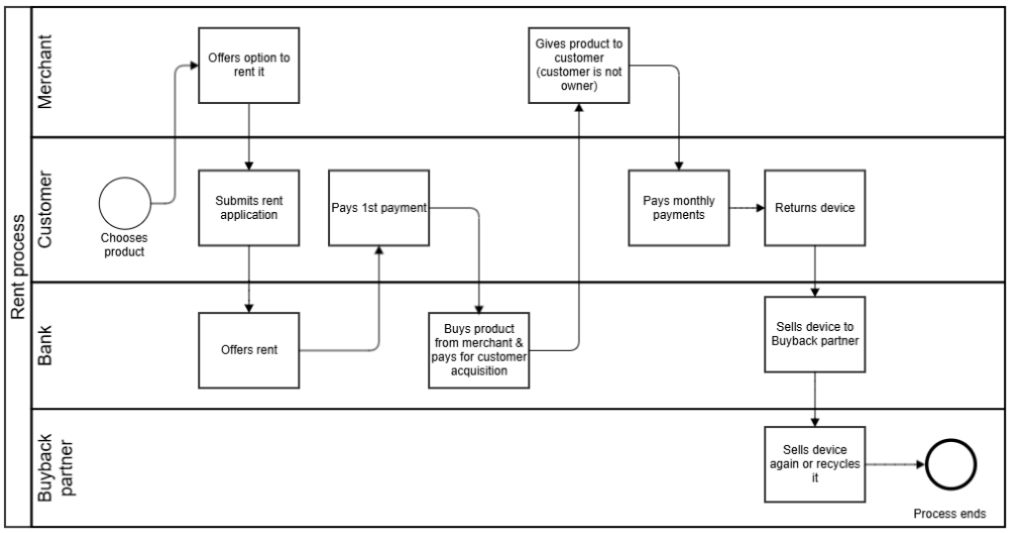


Figure 11. High-level Process of Rent Product (compiled by the author).

The main difference is that with rental the bank becomes the owner of the device. After the rental period is over, the bank takes the device back and sells it to a buyback partner who resells or recycles it. So the devices that are sold during the rental flow are used until the end of their useful life. Customers who want to use used devices, but lack the funds can use hire-purchase as a financing option.

Author created a value stream for both online onboarding flows, and mapped capabilities that already support hire-purchase, and are expected to support the rental value stream together with the outcome that is produced with every step (Figure 12).

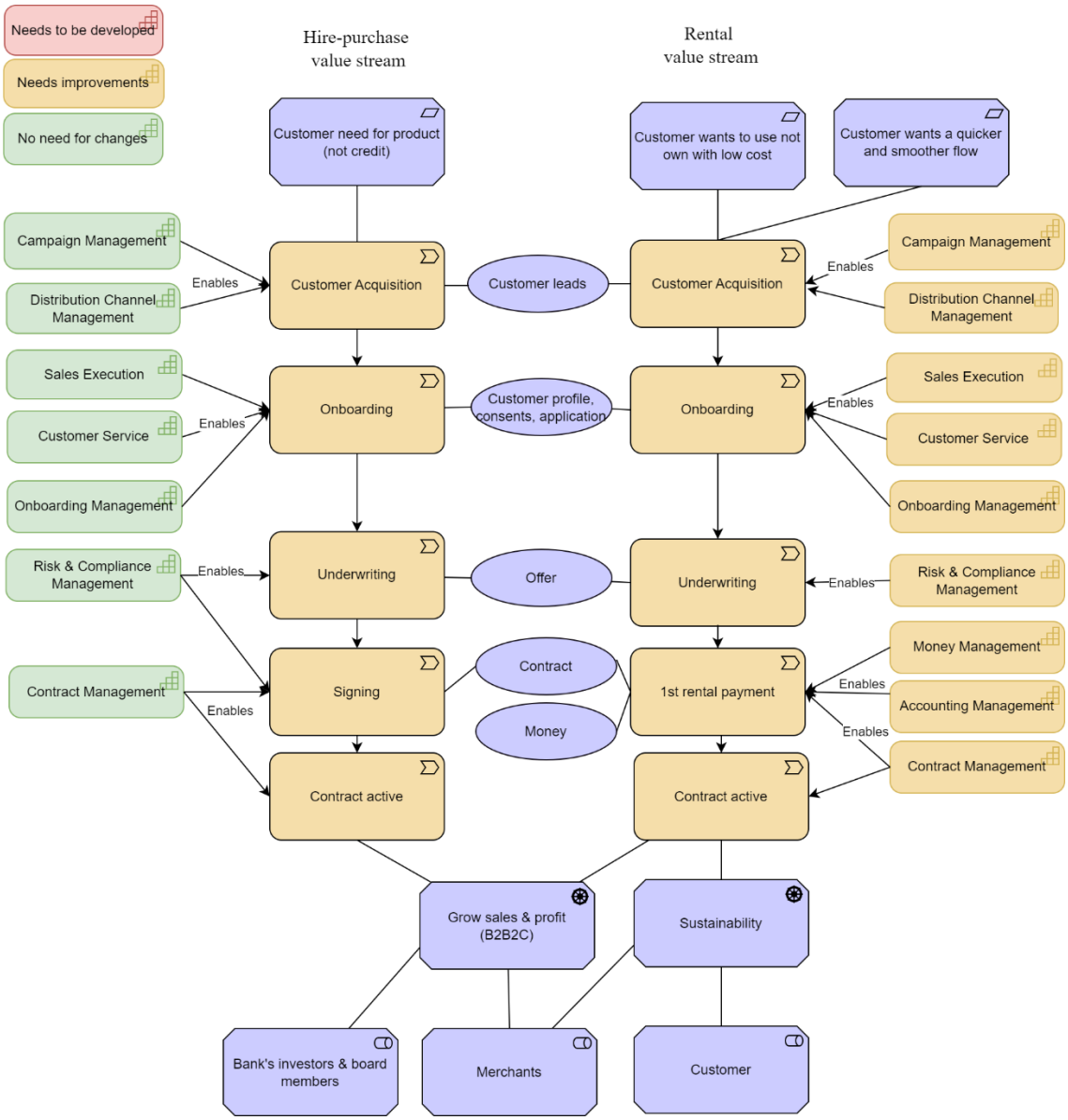


Figure 12. Value Streams of Hire-purchase and Rental Onboarding Flow (compiled by the author).

Both value streams are initiated by the customer's wish for a product for which they don't have enough funds. A rental idea is initiated by the customer's wish to use rather than

own and expectation for a quicker and smoother flow. To purchase a returned item customers can use hire-purchase flow.

Customer acquisition and onboarding for rental and hire-purchase are supported by the same capabilities. For rental, all these capabilities need development as rental product campaigns, materials, and content differ from hire-purchase. Merchants and bank need to make changes in the integration process to offer a new online onboarding process to customers. A new rental onboarding flow needs to be developed for the online distribution channel ePOS. New agreements need to be signed and motivation fees agreed upon with merchants who will start to offer this product. Customer service and salespeople need to be trained to support customers and merchants.

The bank aims to provide fully automatic decisions and an 80% acceptance rate for the rental product, so underwriting processes and systems need development. The customer doesn't need to sign the contract which makes the rental flow simpler.

To mitigate fraud risk, the customer needs to pay the first rental payment before receiving the device. This requires development in money management. Due to the new rental schedule, changes are needed in contract management.

The objective of the bank and merchants to provide an online onboarding value stream is to grow sales and profit. Rental expected profitability is higher than for hire-purchase so providing this as an alternative to customers should contribute to the bank's profitability. By offering these value streams customers who wish to use a device for which they don't have sufficient funds, get fulfilled. Rental will also offer simpler, quicker, and more sustainable choices. Sustainability is also something in which merchants are interested as high-end device sellers are forced by the EU to offer more sustainable solutions.

It became clear that to be able to offer rental flow existing capabilities need development. To make sure that all actions are mapped and put together the project plan author conducted a SWOT analysis for the rental product.

4.4 SWOT Analysis for the Rental Product

To have better clarity regarding the changes and developments that need to be done in the bank author conducted a SWOT analysis of the rental product (Figure 13. Result of

SWOT Analysis of the Rental Product (compiled by the author). SWOT analysis helped to understand the weaknesses and threats that should be mitigated when developing and launching this new product.

Many general strengths and opportunities mentioned in the bank SWOT analysis also support the development and launch of rental products. Most important is the **product engineering capability** as this product can be developed and launched quickly with high quality and can be offered through a wide range of merchants.

Figure 13. Result of SWOT Analysis of the Rental Product (compiled by the author).

Opportunities for rental products can be a **customer-centric strategy** to ensure that the product fits the customer's needs. Rental products offer the bank the opportunity to **expand to new countries more easily** as there are much lower restrictions when offering rental products compared with credit products.

From the weaknesses perspective, the most important is **high dependence on merchants and buyback partners**. Rental offering can only happen through merchants which cuts the profitability as merchants want to get a share of the revenue. The monthly payment of the rental is highly affected by that and also by the price the buyback partner offers

from the used device as the bank is selling used devices to buyback partners not in the second hand market itself.

As the bank **lacks a startup mindset**, a lot of development effort may be wasted before the bank has ensured that there is a **market product fit** and the product will be successful. As renting a tech device is a **new concept** the bank as a forerunner has to be ready to cover the extensive cost of changing the mindset of customers through campaigns.

One important conflict that is already written into the offering is the customer's wish to have **very flexible conditions** when renting. Tech device's price decreases quite quickly after customers start to use them. So to have a break-even point, the bank cannot offer too flexible conditions e.g., the opportunity to return the device at any point in time so customers are offered only up to 3 fixed periods and they cannot return their device before the period is over.

From the perspective of the threats, it's important to mitigate the risk of **buyback partners becoming insolvent** meaning that even though they guarantee to buy back the devices they might not have the funds after 12, 24, or 36 months when the devices are returned. Secondly, **fraud risk** is higher compared to credit products as rental products are more expensive and credit checks are less strict. **Regulatory risk** is present as at some point legislative bodies might decide that this type of rental product should also fall under CCD II regulation. Also, an important thing to mention is the risk of **unclear objectives** which might increase the development cost without the effect on sales.

Based on the capabilities and SWOT analysis several actions were agreed. To mitigate the weaknesses and strengths bank will have a dedicated project manager who is accountable for the roadmap, KPIs, and partnerships making sure that the offering of the rental product will be profitable and that only MVP features will be developed. A marketing plan for the rental product will be agreed upon with a budget. Fraud risk is mitigated through authentication in the onboarding flow. Buyback partners' solvency analysis rules are confirmed and applied.

The author's role in this project:

- Leading the development project and supporting the development teams in defining the MVP and ensuring that the required functionalities were developed by the set deadline.
- Describing the processes and conducting business analysis.
- Creating wireframes for design input and confirming designs with stakeholders.
- Conducting weekly meetings where project teams shared updates and raised concerns.
- Creating development tickets for the online onboarding process and conducting business testing based on the described acceptance criteria.
- Conducting user testing with a small focus group of potential customers.
- Training customer support, bank's, and merchant's salespeople on the onboarding flow.
- Supporting legal, risk, and compliance teams in conducting agreements.
- Supporting the marketing team in the process of creating new marketing materials and email templates.

4.5 Conclusions

According to the motivation model, the rental product is expected to help grow sales and profit and support sustainability. The agreed objectives to achieve the strategic ambitions are raising customer retention and conversion, boosting sales and profit, and offering sustainable solutions through many merchants and verticals.

Rental might be a significant opportunity and the bank wants to be a forerunner in offering this non-credit product. Bank aims to offer customers low payments, and seamless onboarding. Merchants have the opportunity to grow sales together with the bank by attracting new customer segments and reselling used devices. Compared with hire-purchase it is expected to have a higher profitability and retention rate.

Value streams and capability analysis showed that rental online onboarding value stream is very similar to rental. So no new capabilities need to be developed for the rental online onboarding flow, but still, all capabilities need development as even though the rental flow is simpler, it's very different from the hire-purchase flow.

Based on the analysis conducted and reflected in this chapter it was clear for all development teams that to bring the new product to the market they need to make a significant stretch. Still, the value that customers, merchants, and the bank will get from it seems to outweigh this. In the next chapter author analyzes the requirements and creates models of the new online rental onboarding flow which were prerequisites for the development and launch of the rental product.

5 Desired Solution

In this chapter author proposes a solution (designs and models) for the desired online onboarding flow of rental product in ePOS. The reason for choosing this narrow scope was that this was one of the most important parts of the MVP that needed to be launched in September 2023 and the author of the thesis was a member of the team who developed this flow. It was decided to exclude the returnal flow from the first scope (as the first returnal will happen the earliest 12 months after the first contract was signed) and due to that the design and models cover only the online onboarding of a new rental customer.

5.1 Rental Online Onboarding Process

To represent a generic overview of the rental onboarding process author conducted a SIPOC analysis (Figure 14). In the SIPOC analysis author identified a very simplified process of onboarding, and described the suppliers (entities that are providing input to the process), inputs (driver, information), outputs (what is generated from the process), and customers (end-users, recipients for the outputs).

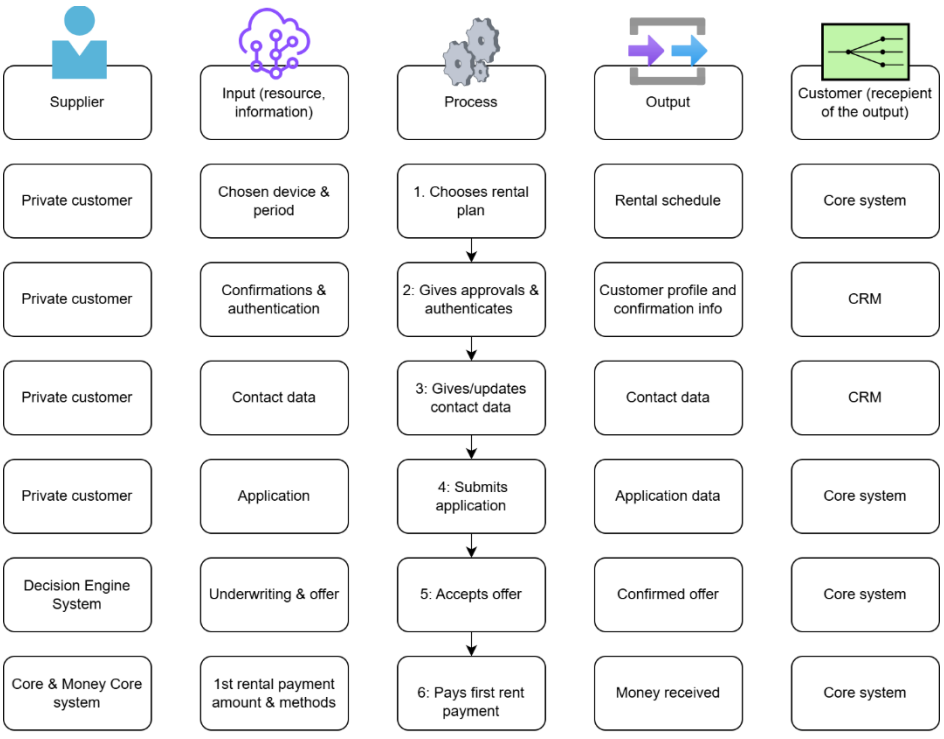


Figure 14. SIPOC Model for Rental Online Onboarding Process (compiled by the author).

SIPOC confirms that the ePOS online flow is fully automatic. Customers can do all the actions without the need for bank employees to interfere. Technical systems that support the actions from the backend are CRM, Core, Decision Engine, and Money Core System application.

The author visualized the steps of the online onboarding flow in a business service model (Figure 15). ePOS online onboarding flow realizes one of the core capabilities for the bank's success: onboarding management capability. In this modal, it is visualized what services support the steps and which of the before-mentioned back-end applications support them.

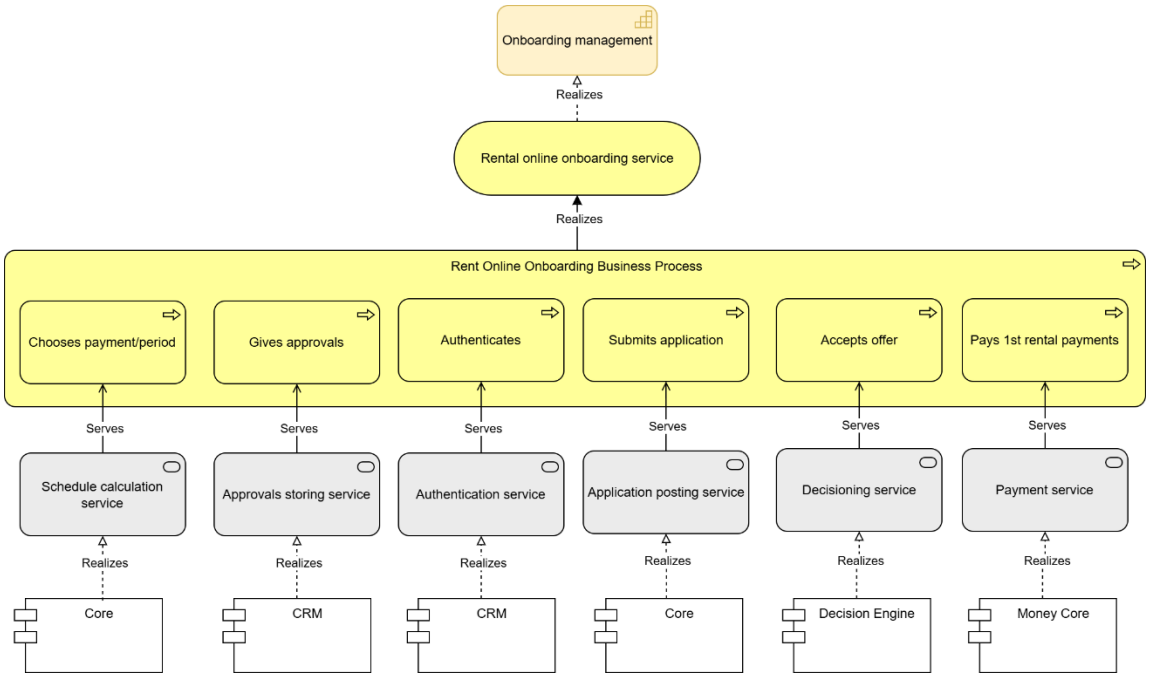


Figure 15. Rental Online Onboarding Service Business Service Model (compiled by the author).

To go more into detail the author conducted a UML use case diagram (Figure 16) that visualizes how the customer and the backend systems interact with ePOS during the online onboarding process. The customer has only 6 simple steps: choosing a rental period and giving approvals (UC1), authentication (UC2), giving or updating contact data (UC3), submitting an application (UC4), accepting the offer (UC5), and paying 1st rental payment (UC6). To capture more detailed info on what exactly happens in those steps and which back-end systems support these steps, the author described every use case in more detail.

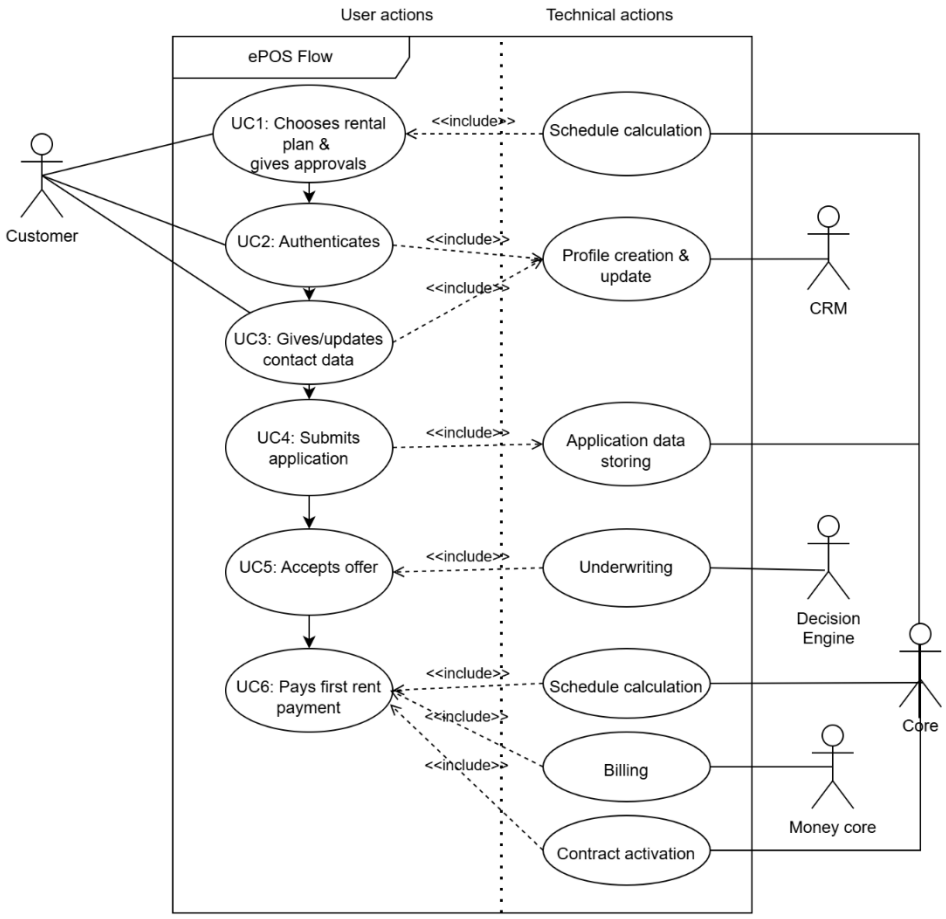


Figure 16. UML Use Case Diagram for Rental Online Onboarding Flow (compiled by the author).

UC1: Chooses rental plan and gives approvals: The customer journey starts with a landing page where different rental periods and their payments are shown. Information about the payment periods and payments is queried from the Core application. The customer chooses a suitable plan. Before continuing customer needs to give approvals.

UC2: Customer authenticates themself (methods: Smart-ID, Mobile-ID, and ID-card). If the customer is an existing customer, their data is updated in the CRM application. If the customer is a new customer, a customer profile is created and data is stored in the CRM application.

UC3: Gives/updates contact data: If the customer is an existing customer their contact data (email and phone number) is shown and they can update it. If they are a new customer they need to give this data as it is mandatory to collect it to be able to contact the customer. Customer data is updated in the CRM application.

UC4: Submits application: After adding and/or reviewing their data, the customer submits a rental application. The application data is posted to the Core application. After posting

the application data, the underwriting process is initiated by the Core application in the Decision Engine application, and decision information is stored in the Core application.

UC5: Accepts offer: ePOS fetches info about the decision from the Core application and displays it to the customer. If the decision is negative this is shown to the customer and the flow ends. If the decision is positive customer needs to agree to the rental terms and accept the offer. Accepting data is stored in the Core application.

UC6: Pays first rent payment: After the rental offer is accepted, ePOS queries the first rental payment amount and payment methods from the Money Core application. The customer initiates the first rental payment and is redirected to the chosen bank to confirm the payment. When the payment is successful, the customer is shown a success view, and the flow ends.

Based on the use case diagram (Figure 16) and the use cases description author mapped the detailed flow of the online onboarding process using BPMN (Figure 17). The author decided to present only the happy flow and not capture all potential scenarios (e.g., error handling). In real life, all scenarios were described, developed, and tested. The actor that was left out of the model is the merchant webshop as the author decided to focus only on the process that happens when the customer is already redirected to ePOS from the webshop.

The value of this diagram is that it shows very clearly every actor's detailed role and also presents clarity on which actions need to happen in parallel. For example, the posting of applications and customer data needs to happen in parallel through different endpoints. The same is true with the 1st rental payment where ePOS needs to show payment methods and 1st rental payment info in the same view and needs to be able to query this data in parallel after the customer has accepted the offer.

With the help of SIPOC, business service model, use case diagram, use cases description, and BPMN diagram author got a very good overview of the expectations for the user flow and based on that described the business service model and functional and non-functional requirements in the subchapter 5.2.

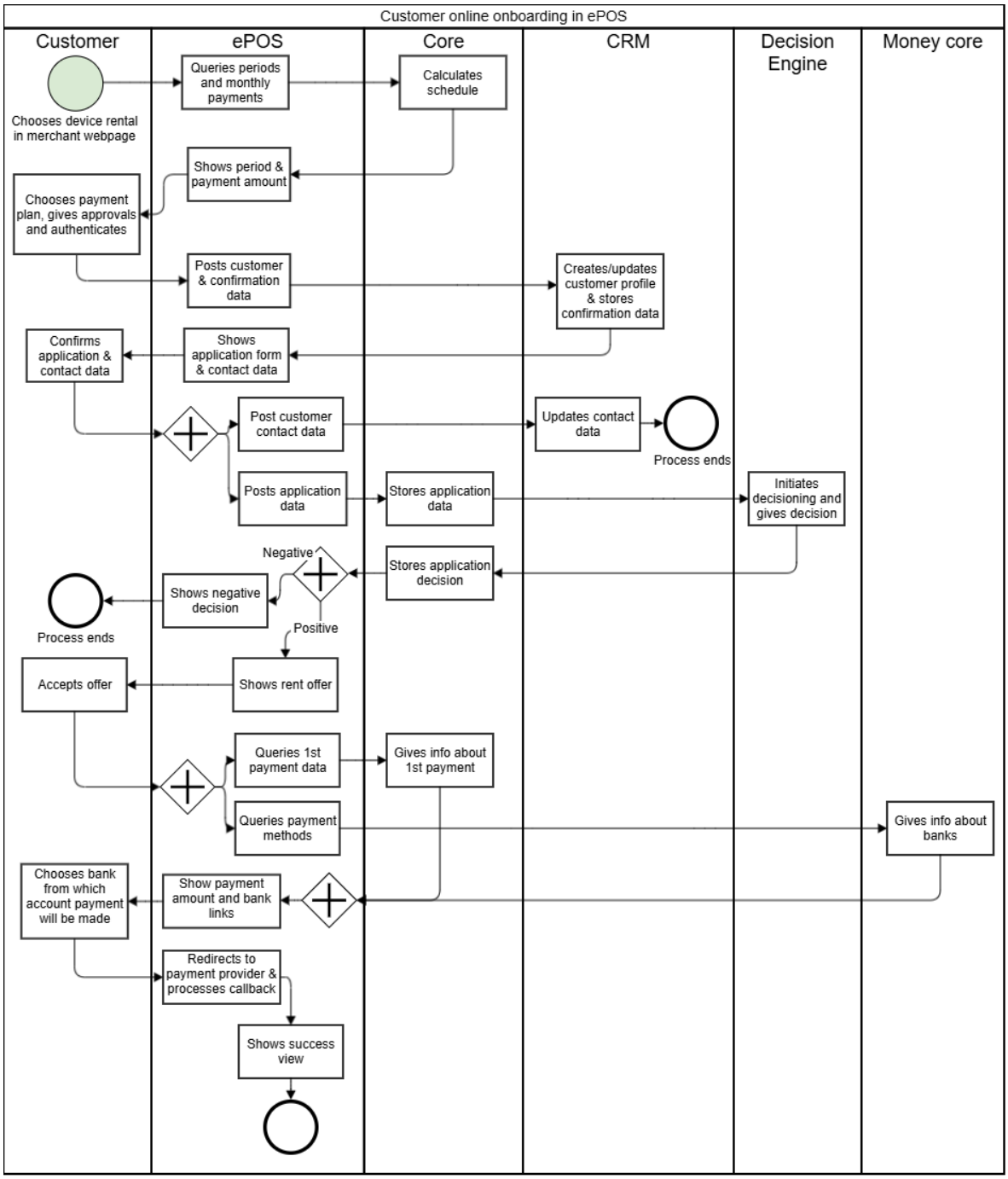


Figure 17. BPMN of the Rental Customer Online Onboarding Process (compiled by the author).

5.2 Requirements for the Rental Onboarding Flow

To capture data that is stored during the online onboarding process author conducted a business information model (Figure 18). This analysis was based on the SIPOC, business service model, use case diagram, use case description, and BPMN diagram that was described in the previous subchapter (5.1).

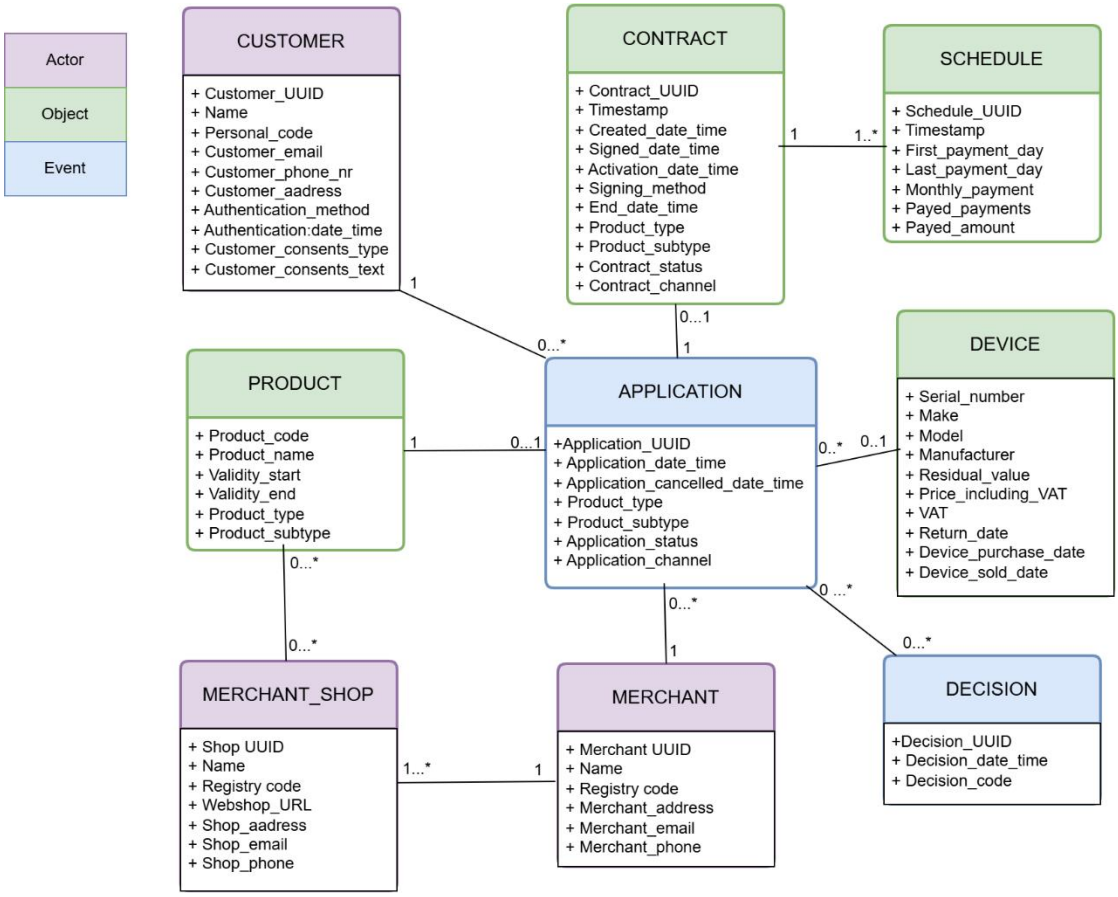


Figure 18. Business Information Model of Rental Online Onboarding Flow (compiled by author)

Before redirect integration between merchant and bank is activated, the bank signs an agreement with the merchants and adds it to the Core application. Information about the merchant is stored in tables „MERCHANT“ and „MERCHANT_SHOP.” Every merchant has at least one shop linked with it.

To make a rental product available for the merchant rent product with its parameters is added to the Core application and product-related data is stored in the table „PRODUCT“. Not all merchants are offering rental products and some merchants are offering several different rental products as for different verticals different products are added.

On the merchant webpage customers choose the device they want to rent. The merchant redirects the customer to ePOS from checkout together with info about the rentable product (stored in table „DEVICE“).

UC1: Chooses rental plan and gives approvals: To be able to show rental payments new rental contract (status inactive) is created and info is stored in „CONTRACT“ and „SCHEDULE’. Rental contracts are distinct in „CONTRACT“ by the product type and

subtype. Every contract has at least 1 active schedule, but if changes are done before activation, new schedules are created that are linked.

UC2: Authenticates: Customer and customer-related approvals data is stored and updated in the 'CUSTOMER' table. Every time customers authenticate themselves, data is updated in this table. The customer gives approvals on the landing page, but they are stored after authentication otherwise, the customer is not known.

UC3: Gives/updates contact data: Data about email and phone numbers are stored in the „CUSTOMER" table.

UC4: Submits application: Information about the application is stored in the „APPLICATION" table and application status is updated. After this underwriting is initiated and application decision info is stored in the „DECISION" table. Decision_code is used to understand if the customer is offered rent or not.

UC5: Accepts offer: Based on the info from the „DECISION" table customer is shown either an offer or a negative decision. If it is a positive decision offer info is put together from tables „DECISION", „APPLICATION", „CONTRACT", „SCHEDULE" and „DEVICE". If a customer accepts the offer in the „CONTRACT" table contract status is updated so that it would be clear that the customer needs to now pay 1st rental payment.

UC6: Pays first rent payment: Payment info is stored in the „SCHEDULE" table. After getting info from the payment provider that payment is successful in the „CONTRACT" table status of the contract is updated and when the money arrives another update is made in the „CONTRACT" and „SCHEDULE" tables as the rental is now active. After receiving success info device return date is calculated and stored in the table „DEVICE".

By storing data as described all use cases are covered with enough data and should be operating as expected. With information stored about channels and statuses, it's possible to analyze the performance of the ePOS channel and track the sales completed through it.

Using the FURPS+ methodology author described the functional and non-functional requirements for the ePOS user interface during the onboarding flow (Table 4. Requirements for the Rental Onboarding Flow (compiled by the author) and also some of the use cases for the backend systems which are important to cover during the business testing of ePOS process. The author decided to represent only these requirements that

were a must for the development and which were chosen to be included in the MVP development.

Table 4. Requirements for the Rental Onboarding Flow (compiled by the author).

Requirement type	**Requirement**
Functionality	**UC1: Chooses rental plan and gives approvals** UC1_1: Fetch info about the monthly payment and possible rental periods from the Core application. UC1_2: Display customer rental payment info, period options, info regarding 1st rental payment day, and prechecked approvals. UC1_3: Customer has the option to change the period. When changing the period, a new monthly payment is fetched and shown. UC1_4: If rental info is not possible to fetch show a proper error to the customer. UC1_5: If the customer removed tickmarks from the approvals' checkboxes, display an error and don't allow to continue. UC1_6: If the customer clicks on the "Back" button the customer is redirected back to the merchant webpage. **UC2: Authenticates** UC2_1: Customer is displayed authentication methods Smart-ID, Mobile-ID, and ID-card and the customer has the option to authenticate themselves. UC2_2: In the mobile view only Smart-ID and Mobile-ID methods are displayed. UC2_3: If authentication is not successful, show an error and allow to authenticate again. UC2_4: If the customer is a new customer, create a profile after successful authentication and store authentication info in the CRM application. UC2_5: If the customer is an existing customer, update the profile after successful authentication and store authentication method info in the CRM application. UC2_6: After successful authentication store approvals type and text in the customer profile in CRM application. UC2_7: If the customer clicks on the "Back" button send the customer back to the previous page. **UC3: Gives/updates contact data** UC3_1: If the customer is a new customer, then after successful authentication ask to add data about their email and phone number. UC3_2: If the customer is an existing customer, then after successful authentication ask the customer to overview their email and phone number. UC3_3: If a customer adds/changes their contact data, store it in the customer profile in the CRM application.

	UC3_4: If from the backend an error is received when storing customer data show a proper error to the customer and allow the customer to make changes in the data input fields. **UC4: Submits application** UC4_1: Post application data to the Core application. UC4_2: Until decision info is queried show to customer a special in-progress page. UC4_3: Fetch decision info from the Core application. **UC5: Accepts offer** UC5_1: Negative decision: Show info why negative and button "Back to merchant´". UC5_3: If the customer clicks on the "Back to merchant" button redirect the customer back to the merchant webpage. UC5_4: Positive decision: Show offer info (monthly payment, period, 1st rental payment amount) and prechecked rental terms and conditions. UC5_5: If the customer doesn't agree with rental terms and conditions (removed tickmark from checkbox) error is shown and customer is not allowed to continue. UC5_6: If the customer clicks on "Cancel" show confirmation view and if the customer confirms, send application cancellation info to the Core application. If the customer doesn't confirm return to offer view. UC5_7: Show the 'Pay now' button in the offer view. **UC6: Pays first rent payment** UC6_1: Show customer logos of banks from where the customer can initiate the 1st rental payment. UC6_2: If a customer chooses a bank, redirect the customer to that bank to make a payment with prefilled data. UC6_3: If payment is successful, show the customer success page and info that after the merchant has confirmed rental from their side, rental contract info will be sent to their email. UC6_4: On the success view show the "Back to merchant" button that redirects the customer back to the merchant webpage. UC6_5: If payment is not successful, show customer error and ask to try again. UC6_6: If the customer clicks on the "Cancel" button show a confirmation view. When the customer confirms the cancellation, cancel the application, if not redirect back to this view.
Usability	* 100% of customers will receive a negative or positive decision within 30 seconds. * Going through the flow takes a maximum of 5 minutes from the customer. * Flow should be so clear that the customer does not need to call customer support. * The flow interface should be mobile-compatible. * Ensure that implementation of the flow follows the agreed design for the desktop and mobile devices.

Reliability	* Customer contact data is shown to the customer only after authentication * Customer-sensitive data is masked in the ePOS logs;
Performance	* 99,9% uptime 24/7 * ePOS pages should not load longer than 2 seconds;
Supportability	* Session is valid for 7 days. * Rental flow should be supported in Estonian, Russian and English. * Errors happening in the flow are logged and monitored. * Flow performance is tracked.
+ Design and copy constraints	* Flow must align with the bank's brand and tone of voice as agreed in the design.
+Integration constraints	* General rules for the merchants to integrate should stay as similar as possible. * Allow merchants the possibility to test the integration and flow in a demo environment.
+Product set-up constraints	* Before a flow can be built a rental product should be set with correct parameters.

5.3 Wireframes of Rental Flow in ePOS

Based on the described use cases in Figure 16. UML Use Case Diagram for Rental Online Onboarding Flow (compiled by the author) and requirements in Table 4. Requirements for the Rental Onboarding Flow (compiled by the author) the author of the thesis and designer created wireframes for the mobile views (shown in fFigure 19 to Figure 24). It was decided to create them 1st for the mobile view as data showed that more than 50% of the existing customers submit applications from a mobile device.

Wireframes were used to align the expectations of the online onboarding flow with the development teams and stakeholders. Wireframes proved to be a good tool to get input without putting too much effort into the clean and beautiful designs and content.

After confirming the wireframes, designs and a prototype were created which the author used for conducting user testing with 6 potential rent users. Based on the outcome of the user testing author of the thesis made changes in the design together with the design team and changes in the text with the help of the copywriter. Unfortunately, the author can't share the actual designs and prototypes that were created for the rental product within this thesis as this is not public information.

As now the expectation of the flow was clear author of the thesis had sufficient info to agree together with the development team on the architecture view of ePOS to understand

if any changes needed to be done there to be able to provide the described flow. Architecture vision and it's analysis is presented in next subchapter.

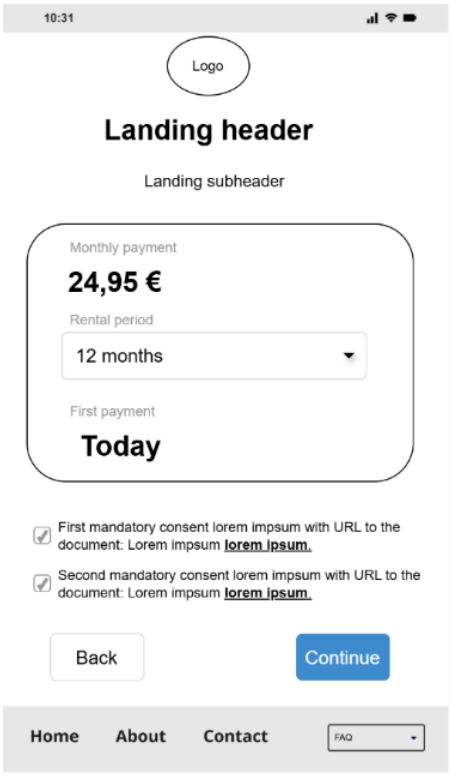


Figure 19. Wireframe for UC1: Chooses rental plan and gives approvals (compiled by the author).

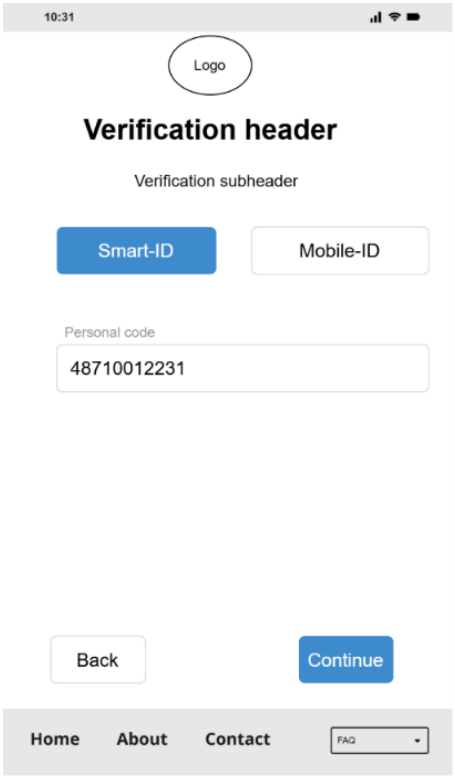
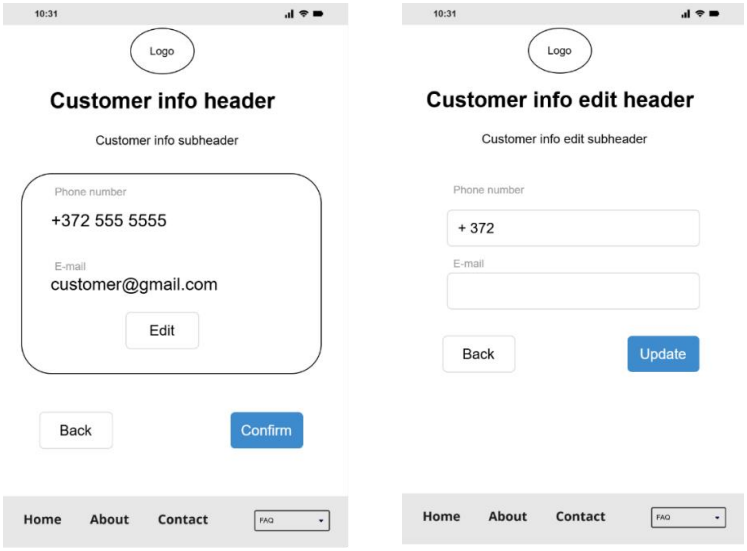
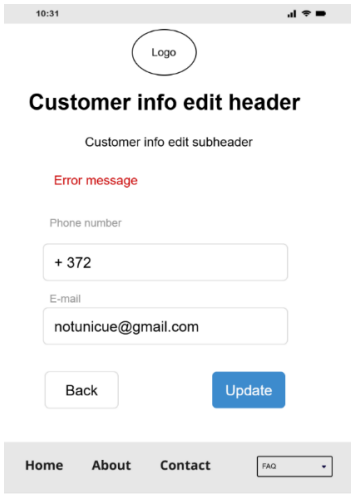


Figure 20. Wireframe for UC2: Authentication (compiled by the author).



(a) (b)

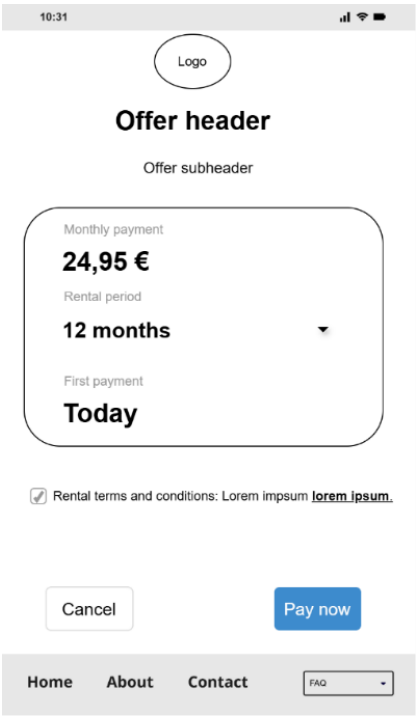


(c)

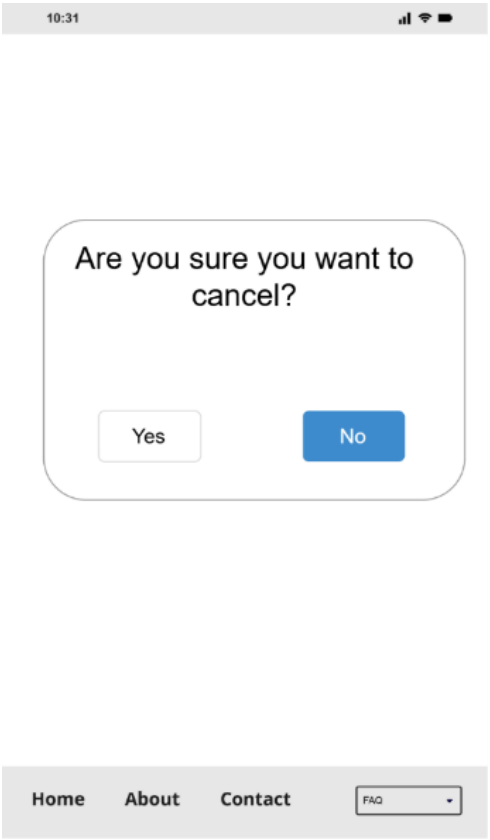
Figure 21. Wireframes for UC3: Gives/updates contact data (a) view for existing (b) for new customer and (c) view in case of error) (compiled by the author).

Figure 22. Wireframe for UC4: Submits application (compiled by the author).

(a)

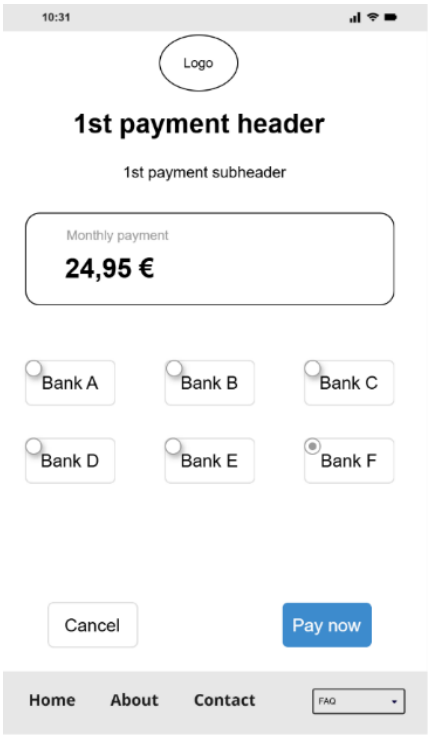


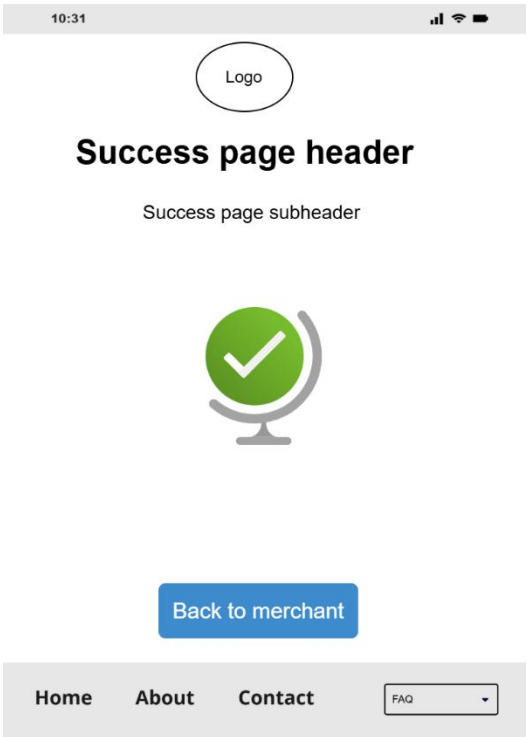
(b)



(c)

Figure 23. Wireframes for UC5: Accepts offer (a) view for negative decision, (b) positive decision, and (c) cancelling offer) (compiled by the author).





(a) (b)

Figure 24. Wireframes for UC6: Pays first rent payment (a) view before payment is initiated and (b) after successful payment) (compiled by the author).

5.4 Architecture of ePOS

As the ePOS interface together with its supporting back-end applications already existed for applying different credit and non-credit products then there was no need to start building anything new. The author of the thesis analyzed the existing architecture together with the development teams to understand if any changes needed to be made there. The architecture of ePOS is presented on Figure 25.

Architecture has 4 layers: presentation, communication, application, and data layer. The presentation layer consists of the merchant's webshop and ePOS. Customers are redirected to ePOS from the merchant webshop. Interaction between the customer and the bank is happening in the ePOS user interface. In case of a positive, or negative decision or when the customer cancels their application, ePOS gives information to the merchant's webshop so that the merchant will know if the order will be paid by the bank or not.

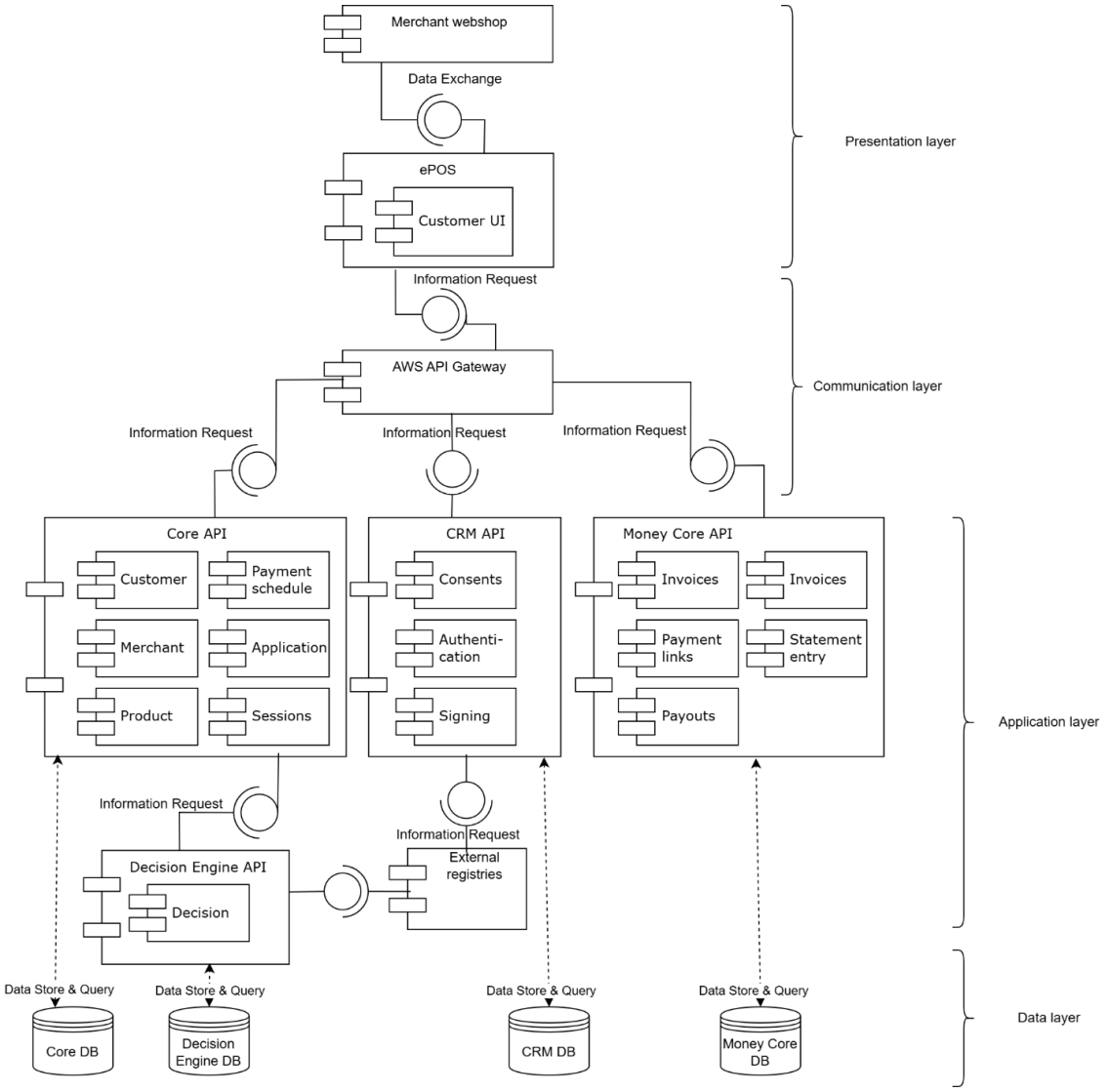


Figure 25. ePOS Architecture UML Component Diagram (compiled by the author).

In Figure 25 in the application layer, the author has visualized all the backend applications that are needed to provide an ePOS user interface to customers and the functionalities that these applications are managing. The business role of these back-end applications (Core, CRM, Money Core, Decision Engine) regarding offering rental is visualized in Figure 16, Figure 17, and Figure 18.

ePOS interacts with the backend applications through the AWS API gateway. This gateway keeps the back-end and front-end services decoupled. This ensures that there is a trustworthy and scalable system where changes can be implemented easily without breaking other systems and which can be monitored separately.

The Core application interacts with the Decision Engine directly. Both CRM and Decision Engine applications interact with external registries to be able to provide their services.

For example, external registries are used to check if customers have tax arrears. For all the applications data is stored separately as shown on the data layer.

Changes that were needed to be able to offer rental flow were described in the previous subchapters, but no changes were needed to be done to the architecture as this already supported the offering of the product.

5.5 Conclusions

In this chapter, the author described the desired rental flow that was designed and modeled by the author. Methods that were used and their outcome:

- SIPOC gave a general overview of the rental online onboarding flow, its inputs, and outputs.
- The business service model presented the simplified online onboarding flow and confirmed that the new flow realized the onboarding management capability.
- UML use case diagram visualized how the customer and the backend systems interact during the online onboarding flow which consists of 6 use cases.
- BPMN described the full online onboarding happy flow.
- The business information model described why, where and what info should be stored during the flow.
- With the help of FURPS+ the author described functional and non-functional requirements.
- Wireframes visualized the actual user flow.
- UML Component Diagram presented the architecture of the ePOS user interface and the applications that support the flow.

As the rental flow is simpler and differs from the hire-purchase several changes need to be developed to be able to offer this flow. Based on the analysis presented in this chapter, the author of the thesis created development tickets for the ePOS development team including several acceptance criterias and links to the design and prototype, and the development of the rental product was kicked off.

Summary

The goal of the master thesis was to design and model a new rental service. To achieve this goal, the author described the embedded finance market in the EU, conducted a business analysis of the bank, described the bank's motivation to offer rental service, and designed and modeled the desired solution. Master's thesis outcomes are:

- Overview of the Estonian and EU embedded finance market (including current situation, challenges, and forecast) and tech rental providers.
- Overview of the bank's business values, strategic goals, and key performance indicators.
- SWOT analysis results analysis with proposals on how to mitigate the weaknesses and threats.
- Motivation analysis to understand which strategic goals offering rental product will help to solve.
- Analysis of the new rental product concept, its value stream, and the bank's capabilities which are needed for offering this product.
- SIPOC model that describes inputs and outputs of the online rental onboarding process.
- BPMN model that describes hire-purchase and rental product general flow.
- Rental Online Onboarding Service Business Service Model.
- UML Use Case Diagram that describes how customers and the bank's backend systems interact during rental online onboarding flow in ePOS.
- Business information model that describes in which tables data is stored during the rental online onboarding process.
- List of functional and non-functional requirements for the rental online onboarding flow;
- Wireframes of the rental online onboarding flow;
- UML Component Diagram that models the high-level software components that support the rental online onboarding flow.

The e-commerce sector has grown immensely, and embedded financing solutions will continue to grow in its wind. It is expected that customer financing will move from direct lending to embedded as more and more customers want to use the credit exactly at the moment when they need it.

In light of CCD II which turns BNPL into a credit product, rent could be a perfect fit for the bank to offer customers a frictionless, quick, and easy application process, but also show that they care about the planet.

SWOT analysis confirmed that building a rental product is supported by strong product engineering capability, a wide range of merchants offering the bank's product, strong sales management, and effective risk and compliance management. Rent is supported by the customer trend to use rather than own and the bank's strategic goal to have a higher profitability.

The bank considers rent to be a significant opportunity for the bank and its merchants to grow sales and increase profitability by attracting new customers, offering additional services, and high retention rate. Rent is expected to offer customers seamless and non-frictionless flow with 100% automatic and 80% positive decisions. Value streams and capability analysis showed that all capabilities that are needed to offer online onboarding flow needed development.

ePOS online onboarding flow will be a fully automated flow that is supported by ePOS, CRM, Core, Decision Engine, and Money Core System. Online onboarding consists of 6 use cases: choosing a rental plan and giving approvals, authentication, giving/updating contact data, submitting an application, accepting the offer, and paying 1st rental payment. This flow supports the onboarding management capability. Information during the process is stored in 9 tables from which only „DEVICE" is a new table that is created. When describing functional and non-functional requirements author chose also to describe the design, copy, integration, and product set-up constraints. Wireframes were a good input for the design as they described all the steps of the rental online onboarding happy flow. Architecture UML Component Diagram represented all the layers of the architecture that supported the online onboarding flow.

The rental product was launched in September 2023.

References

[1] Estonian Financial Supervision and Resolution Authority, "Eesti finantsteenuste turg," 31 12 2023. [Online]. Available: https://www.fi.ee/sites/default/files/FI_EFT_2024_0.pdf. [Accessed 4 October 2024].

[2] A.T. Kearney Holdings Limited, "Profitable now, prepared for tomorrow? The tightrope walk of European retail banks," 23 April 2024. [Online]. Available: https://www.kearney.com/industry/financial-services/european-retail-banking-radar/article/profitable-now-prepared-for-tomorrow-the-tightrope-walk-of-european-retail-banks. [Accessed 1 October 2024].

[3] S. Espenberg, K. Pulk, L. Riitsalu, S. Trankmann, K. Krillo ja V. Kõve, „Krediidituru uuring: lõpparuanne,“ RAKE, Tartu, 2021.

[4] M. Hassan, "Secondary Data – Types, Methods and Examples," ResearchMethod, 25 March 2024. [Online]. Available: https://researchmethod.net/secondary-data/. [Accessed 11 June 2024].

[5] F. R. David, Strategic Management Consepts and Cases (13th ed.), New Jersey: Prentice Hall, 2011.

[6] "Understanding the ArchiMate Motivation View: Unveiling the WHY, WHOM, and WHAT," Visual Paradigm, 1 August 2024. [Online]. Available: https://guides.visual-paradigm.com/understanding-the-archimate-motivation-view-unveiling-the-why-whom-and-what/. [Accessed 3 September 2024].

[7] The Open Group, "Value Streams," April 2022. [Online]. Available: https://pubs.opengroup.org/togaf-standard/business-architecture/value-streams.html#_ftnref1. [Accessed 3 September 2024].

[8] Modern Analyst, "Capability-Based Planning with ArchiMate®," [Online]. Available: https://www.modernanalyst.com/Resources/Articles/tabid/115/ID/5248/Capability-Based-Planning-with-ArchiMate.aspx. [Accessed 3 September 2024].

[9] M. Pellegrini, "The Business Canvas: An Emerging Visual Genre of Professional Communication," in *SIGDOC '21: Proceedings of the 39th ACM International Conference on Design of Communication*, West Lafayette, 2021.

[10] J. S. Pruitt and T. Adlin, The Persona Lifecycle: Keeping People in Mind Throughout Product Design, San Francisco: Morgan Kaufmann, 2006.

[11] Olanab, "SIPOC Analysis in Continuous Improvement Explained," [Online]. Available: https://www.olanabconsults.com/articles/sipoc-analysis-in-continuous-improvement-explained. [Accessed 4 August 2024].

[12] Object Management group, "Business Process Model and Notation Version 2.0.2," December 2013. [Online]. Available: https://www.omg.org/spec/BPMN/2.0.2/PDF. [Accessed 5 May 2024].

[13] Lucidchart, "UML Use Case Diagram Tutorial," [Online]. Available: https://www.lucidchart.com/pages/uml-use-case-diagram. [Accessed 1 November 2024].

[14] T. Priebe, "Business Information Modeling: A Methodology for Data-Intensive Projects," October 2015. [Online]. Available: https://www.researchgate.net/publication/283487392_Business_Information_Modeling_A_Methodology_for_Data-Intensive_Projects_Data_Science_and_Big_Data_Governance. [Accessed 10 October 2024].

[15] "What is FURPS+?," Center of Excellence for Professional Development, 5 August 2024. [Online]. Available: https://businessanalysttraininghyderabad.wordpress.com/2014/08/05/what-is-furps/. [Accessed 22 November 2024].

[16] S. Gupta, "How to Create a WireFrame: Step-by-Step Guide," Springboard, 9 August 2021. [Online]. Available: https://www.springboard.com/blog/design/how-to-create-a-wireframe/. [Accessed 1 December 2024].

[17] S. Ambler, "UML Component Diagrams: An Agile Introduction," Agile Modeling, [Online]. Available: https://agilemodeling.com/artifacts/componentdiagram.htm. [Accessed 11 November 2024].

[18] K. Rajari, "Euroopa e-kaubanduse ülevaade 2024," Estonian Ecommerce Association, 31 October 2024. [Online]. Available: https://www.e-kaubanduseliit.ee/uudised/euroopa-e-kaubanduse-ulevaade-2024. [Accessed 29 December 2024].

[19] Mastercard, "Future of Credit. A European Perspective. Second Edition, Q4 2023," 2023. [Online]. Available: https://www.mastercard.com/news/media/seqd0ut2/future-of-consumer-credit-a-european-prospective-mastercard.pdf. [Accessed 1 October 2024].

[20] Eurostat, "Euro area unemployment," 1 March 2024. [Online]. Available: https://ec.europa.eu/eurostat/en/web/products-euro-indicators/w/3-01032024-bp. [Accessed 1 October 2024].

[21] Statistics Estonia, "Töötuse määr," December 2024. [Online]. Available: https://stat.ee/et/avasta-statistikat/valdkonnad/tooelu/tooturg/tootuse-maar. [Accessed 30 December 2024].

[22] Savills Research, "European Retail Market," 2023. [Online]. Available: https://pdf.euro.savills.co.uk/france/fre-fre/european-retail-report---mapic-2023.pdf. [Accessed 1 October 2024].

[23] M. Rõbinskaja and T. Mertsina, "Estonian Household Consumption," 8 July 2024. [Online]. Available: https://www.swedbank-research.com/english/macro_focus/2024/24-07-01/estonian_household_consumption.pdf. [Accessed 29 December 2024].

[24] Estonian Financial Supervision and Resolution Authority, "The Estonian Financial Services Market as at 30 June 2024," 30 June 2024. [Online]. Available: https://www.fi.ee/sites/default/files/fi_eft_2024_eng.pdf. [Accessed 29 December 2024].

[25] McKinsey ja Company, "Embedded finance: How banks and customer platforms are converging," 15 July 2024. [Online]. Available: https://www.mckinsey.com/industries/financial-services/our-insights/embedded-finance-how-banks-and-customer-platforms-are-converging. [Accessed 2 August 2024].

[26] RBC Capital Markets, "Buy Now, Pay Later: How an Old Idea got a New Lease of Life," 9 November 2021. [Online]. Available: https://www.rbccm.com/en/insights/industries-in-motion/podcast.page?dcr=templatedata/article/podcast/data/2021/11/buy_now_pay_later_how_an_old_idea_got_a_new_lease_of_life. [Accessed 12 October 2024].

[27] L. Trisberg and T. Väät, "BNPL ehk Buy Now Pay Later. Uus trend šhoppamises!," Estonian Ecommerce Association, 21 October 2021. [Online]. Available: https://www.e-kaubanduseliit.ee/uudised/bnpl-ehk-buy-now-pay-later-uus-trend-shoppamises. [Accessed 29 December 2024].

[28] Congressional Research Service, "Rapidly Growing “Buy Now, Pay Later” (BNPL) Financing:," 8 August 2024. [Online]. Available: https://crsreports.congress.gov/product/pdf/IF/IF12734. [Accessed 14 July 2024].

[29] K. Kippa, "Tarbijakrediidilepingu regulatsiooni kohaldamine buy now pay later ärimudelile," *Õiguskeel,* vol. 2, pp. 1-11, 2024.

[30] European Council, "Asking for a loan will be safer in the EU after the Council’s final approval of the Consumer Credit Directive," 9 October 2023. [Online]. Available: https://www.consilium.europa.eu/en/press/press-releases/2023/10/09/asking-for-a-loan-will-be-safer-in-the-eu-after-the-council-s-final-approval-of-the-consumer-credit-directive/. [Accessed 1 September 2024].

[31] D. Johnson, J. Rodwell and T. Hendry, "Analyzing the Impacts of Financial Services Regulation to Make the Case That Buy-Now-Pay-Later Regulation Is Failing," 2021. [Online]. Available: www.mdpi.com/journal/sustainability.

[32] D. McDaid, I. Zechmeister, R. Kilian, H. Medeiros, M. Knapp ja B. Kennelly, „Making the economic case for the promotion of mental well-being and the prevention of mental health problems,“ London School of Economics and Political Science, London, 2008.

[33] S. Angel, "The Effect of Over-Indebtedness on Health: Comparative," *KYKLOS,* vol. 69, no. 2, p. 208–227, 2016.

[34] M. B. Cuesta and S. Budría, "IZA Discussion Paper No. 8912: The Effects of Over-Indebtedness on Individual Health," March 2015. [Online]. Available: https://docs.iza.org/dp8912.pdf. [Accessed 9 September 2024].

[35] A. Sherif, "Market share of mobile operating systems worldwide from 2009 to 2024, by quarter," Statista, 23 September 2024. [Online]. Available: https://www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/. [Accessed 14 October 2024].

[36] McKinsey ja Company, "Thinking inside the subscription box: New research on e-commerce consumers," [Online]. Available: https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/thinking-inside-the-subscription-box-new-research-on-ecommerce-consumers. [Accessed 3 August 2024].

[37] Eurostat, "Waste statistics - electrical and electronic equipment," October 2023. [Online]. Available: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics_-_electrical_and_electronic_equipment. [Accessed 10 October 2024].

[38] V. Forti, C. P. Baldé, R. Kuehr and G. Bel, "The Global E-waste monitor 2020: Quantities, flows, and the circular economy potential," 2020. [Online]. Available: https://www.itu.int/en/ITU-D/Environment/Documents/Toolbox/GEM_2020_def.pdf. [Accessed 1 October 2024].

[39] European Comission, "Waste from Electrical and Electronic Equipment (WEEE)," [Online]. Available: https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. [Accessed 12 October 2024].

[40] European Comission, "Study on options for return schemes of mobile phones, tablets and other small electrical and electronic equipment in the EU," May 2022. [Online]. Available: https://op.europa.eu/en/publication-detail/-/publication/f049cf4f-ed23-11ec-a534-01aa75ed71a1/language-en. [Accessed 14 July 2024].

[41] Deloitte, "Global mobile consumer trends," 2017. [Online]. Available: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-global-mobile-consumer-survey-second-edition.pdf. [Accessed 2 October 2024].

[42] S. De Marzo, "Vienna-based refurbed closes €54 million Series C to turbo charge growth of refurbishment industry," 7 November 2023. [Online]. Available: https://www.eu-startups.com/2023/11/vienna-based-refurbed-closes-e54-million-series-c-to-turbo-charge-growth-of-refurbishment-industry/. [Accessed 10 October 2024].

[43] A.T. Kearney Holdings Limited, "Electronics-as-a-service: a sustainable alternative to business-as-usual?," 13 February 2023. [Online]. Available: https://www.kearney.com/service/sustainability/article/-/insights/electronics-as-a-service-a-sustainable-alternative-to-business-as-usual. [Accessed 2 October 2024].

[44] Riverty, "Subscription payments consumer survey," [Online]. Available: https://www.riverty.com/498e35/globalassets/media-images/insights/subscribtion-survey/riverty_bi_subscription-payments_def.pdf. [Accessed 30 May 2024].

[45] Statistics Estonia, „Population census: the average home in Estonia is older than the average person,“ 5 October 2022. [Võrgumaterjal]. Available: https://rahvaloendus.ee/en/news/population-census-average-home-estonia-older-average-person. [Kasutatud 29 December 2024].

[46] Eurostat, "Passenger cars in the EU," December 2024. [Online]. Available: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_cars_in_the_EU. [Accessed 29 December 2024].

[47] E. Panzaru and A. Aun, "Sharing Economy Index 2023," 2024. [Online]. Available: https://consumerchoicecenter.org/wp-content/uploads/2023/12/Sharing-Economy-Index-2023.pdf. [Accessed 29 December 2024].

[48] European Parliament and the Council, "Directive (EU) 2023/2225 on credit agreements for consumers," 30 October 2023. [Online]. Available: https://eur-lex.europa.eu/eli/dir/2023/2225/oj. [Accessed 17 March 2024].

[49] R. Sharma, " Mobile Phone Rental Market Research Report 2032," 2023. [Online]. Available: https://dataintelo.com/report/mobile-phone-rental-market. [Accessed 29 December 2024].

[50] Topi, "Topi webpage," [Online]. Available: https://www.topi.eu/en/rent. [Accessed 4 October 2024].

[51] Grover, "Grover hits unicorn valuation of over $1bn, on its way to become global market leader in consumer-tech subscription," 7 April 2022. [Online]. Available: https://press.grover.com/184606-grover-hits-unicorn-valuation-of-over-1bn-on-its-way-to-become-global-market-leader-in-consumer-tech-subscription. [Accessed 4 October 2024].

[52] Nordic 9, "Wiserentr raised a €1.6 million funding round led by BBVA and Anthemis," 30 March 2022. [Online]. Available: https://nordic9.com/news/wiserentr-raised-a-16-million-funding-round-led-by-bbva-and-anthemis/. [Accessed 4 October 2024].

[53] topi, "topi partners with Macquarie Bank Europe and secures a new funding facility," 30 July 2024. [Online]. Available: https://www.topi.eu/en/blog/topi-partners-with-macquarie-bank-and-secures-a-new-funding-facility. [Accessed 2 October 2024].

[54] Grover, "About Grover," August 2024. [Online]. Available: https://service.grover.com/hc/en-us/articles/19908558093074-About-Grover. [Accessed 4 October 2024].

[55] techfundingnews, "Female-founded fintech Topi gets $45M to offer Hardware-as-a-Service for B2B merchants," 31 August 2022. [Online]. Available: https://techfundingnews.com/female-founded-fintech-topi-gets-45m-to-offer-hardware-as-a-service-for-b2b-merchants/. [Accessed 3 October 2024].

[56] Knowledge Hub, "Grover - Flexible Tech Rental Service," 7 February 2022. [Online]. Available: https://knowledge-hub.circle-economy.com/article/12254?n=Grover---Flexible-Tech-Rental-Service. [Accessed 4 October 2024].

[57] Grover, "Rest easier," [Online]. Available: https://www.grover.com/de-en/g-about/grover-care. [Accessed 1 October 2024].

[58] Finextra Research, "BBVA and Anthemis invest in Spanish consumer electronics rental firm Wiserntr," 4 April 2022. [Online]. Available: https://www.finextra.com/pressarticle/92141/bbva-and-anthemis-invest-in-spanish-consumer-electronics-rental-firm-wiserntr. [Accessed 3 October 2024].

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