



Linnæus University
Sweden

Degree project

A concept development of the HirePadlock product

With a focus on setting requirements for the product
and implementing a customer survey



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Abstract

Many industrial companies place high demands on product development, from a simple idea to a finished product and then bring it to market. Therefore, there has been a rapid development of methods, models and working methods in product development. This development is mostly about the product having a balance between price, quality, customer adaptation, safety, production, and less environmental impact.

This study is a degree project in the Bachelor of Science program at Linnaeus University, Faculty of Technology and was carried out on behalf of the company The HirePadlock. The purpose of the report is to study and determine the product development process in a company. The study describes which factors and methods are most decisive in a product development process for the selected company.

The results of the study show that product development is a complicated work that requires a lot of coordination and planning to be able to be processed in an effective way. The company must understand, among other things, the customer's needs, the product's functional requirements and market competitors. It is important to find out these factors in product development by conducting market research and value proposition, among other things.

Keywords: The HirePadlock, competitors, design, product development, survey, customer needs, value proposition, product functional requirements, Blocket, Hygglo, rental.



Sammanfattning

Många industriella företag ställer höga krav på produktens framtagning, från en enkel idé till en färdig produkt och sen få ut den på marknaden. Därför har det skett en snabb utveckling av metoder, modeller och arbetssätt inom produktutveckling. Denna utveckling handlar mest om att produkten ska ha en balans mellan pris, kvalitet, kundanpassning, säkerhet, produktion samt mindre miljöpåverkan.

Denna studie är ett examensarbete inom högskoleingenjörsprogrammet vid Linnéuniversitetet, Fakulteten för Teknik som genomfördes på uppdrag av företaget The HirePadlock. Rapporten har som syfte att studera och bedöma produktutvecklingsprocessen i ett företag. Studien redogör vilka faktorer och metoder som är mest avgörande i en produktutvecklingsprocess för det valda företaget.

Resultatet av undersökningen visar att produktutvecklingen är ett komplicerat arbete som kräver mycket samordning och planering för att kunna behandlas på ett effektivt sätt. Företaget måste ha en förståelse för bland annat kundens behov, produktens funktionella krav och marknads konkurrenter. Det är viktigt att ta reda på dessa faktorer inom produktutvecklingen genom att göra marknadsundersökningar och en värdeproposition.

Nyckelord: The HirePadlock, konkurrenter, design, produktutveckling, enkätundersökning, kundens behov, värdeproposition, produktens funktionella krav, Blocket, Hygglo, uthyrning.



Preface

This study is the result of the final part of the Bachelor of Science program, Mechanical Engineering & Industrial Economics consisting of 180 hp at the Linnæus university. The degree thesis contained 15hp and was done by the engineering students, Adis Demirovic & Adna. A. Abdi during the spring semester 2022.

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1 Introduction

The following chapter contains an introductory presentation of the projects background, a brief description of the problematization, the purpose and goal, research questions, relevance, and limitations. Lastly, a company description is presented.

1.1 Background

During the early 2000s, the focus increased on customer needs in the manufacturing industry, which in turn set the requirements for flexibility and rapid product development. Resource-efficient and environmentally friendly production processes and products became among the most important competitive factors during the 2000s (Johannesson 2013). At present, most companies compete against each other in today's market, where both Economics and technology globalization are included as a trigger for increased competition. For other companies, it is important to find new ways to differentiate. The customer's needs can be seen as a means of competition, therefore it is important to meet it in a productive way. This means that companies must offer more resources to identify customers' new needs, as these needs can change over time. If it happens that companies fail in identifying these, it may not be easy for them to survive in the market (Wolffelt 2005). Today, it is very important that the products on the market reflect what the organization stands for, their business perception. It is also important to define the factors that are important in product development so that the company can develop new products that the customer values (Isaksson 2004).

Sustainable development is a term that has been discussed over the entire world for over thirty years. Since then, there's been noticeably accomplishments globally, including a decrease in ozone-depleting substances, an increase in the use of renewable energy sources, and a reduction of emissions and economic growth. Since then, the society has been able to turn into more efficient consumption of resources which includes a more stable resource production and a re-usage of the materials (Lukman, R.K. et al., 2016).

Nowadays, it is widely known that entrepreneurship is one of the main reasons behind industrial dynamism, economic growth, and progress. But the field of entrepreneurship research is quite young and developing quickly. Therefore, it has advanced in several different sub-fields within various areas, such as economics, marketing, finance, management, and business administration and so on (Carlsson, B. et al., 2013).

The HirePadlock, is a new product idea and a company that still is in its start-up phase. The HirePadlock platform is an idea where people can rent or lend out goods like outdoor equipment and garden equipment. The system consists of the HirePadlock product and the HireProduct application. The HirePadlock product is meant to be a padlock that acts as a security device which helps secure different assets, for example a bike. One of the main features with the product is that it can be interacted with mobile devices like smartphones and smartwatches. The HireProduct



app is a digital content domain which is used to offer different things on the market where the customer can hire the products that are offered. Since the company is only in its first phase, the process of developing an idea into a new product can be very complex and risky, as it is an investment made in the form of training that takes both more time and money. To run a new project, it is necessary to utilize the competence that exists within the people who are working on the process to make the right decisions that are required to succeed in the work.

In short, this project will be about presenting the company idea, finding out if there is an interest in the platform by doing a survey and developing a concept for a padlock which interacts with a smartphone or a smartwatch. A lock that can be abandoned and unlocked through a wireless connection. To open it with a wireless connection it must have a built in Bluetooth or NFC that interacts with the smartphone.

1.2 Problematization

The concept of product development means developing and improving an existing or new product that is to come on the market. This process usually goes through several phases and to do it effectively, the company needs a good knowledge of all disciplines, and an understanding of how these phases affect each other. Examples of such knowledge can be the technical knowledge where the engineering role stands as a problem solver and works, among other things, with developing products and finding solutions based on the users' different needs. The other knowledge is process knowledge, and it is often about entrepreneurship, processes, deadlines, resources, budgets, and profits. Further and the most important knowledge is the customer need, and for a company to be successful, it must identify who the customers are, which can be somewhat difficult as the customer's needs have changed over time. To find out which key factors are important to the customer, the company must look at the competitors that are in the market and what they offer for services. If the company has no competitors, it is important to try to identify customers in other ways, such as conducting market research and other studies.

1.3 Purpose and goal

The purpose of this project is to analyse and evaluate the product development process in the company. Which includes presenting the company idea, setting the requirements for the physical product, and collecting the customer needs to be able to generate a concept.

The goal of the project is to help the company develop a concept for the idea of the HirePadlock platform but also to find out if there are people who would be interested in using the platform in the future by doing a survey.

1.4 Research questions

This project was carried out to be able to answer the questions:



- In what way are customers involved in and affecting the product development process?
- What needs does the product meet based on the consumer?

1.5 Relevance

The background section defines several different problems that can arise for a new company such as the HirePadlock in a competitive market. That the company is new, small and can be relatively undeveloped within its operations. Its tabulation can therefore be modest and with low availability. At the same time, it describes the importance of getting to know your customers well and their needs. To reach more customers, the organization needs to be where the customer is. This helps increase the comfort of their important target audience. It is also important to know more about who their competitors are and to take a closer look at what they offer, it can be a crucial way for the HirePadlock to grow. It can also give the company ideas to improve their products / services and it's marketing (Keeney 1990).

The padlock in combination with the mobile application offers an opportunity for the people to offer their asset on the market to be hired or lent out. By lending out the assets the owner can make an earning on an asset that could be potentially abandoned, for example a fishing rod and equipment that is collecting dust in a basement. This also helps people who need a product to search for it on the market through the HireProduct app. By offering the products on the app, it gives people the opportunity to share valuable goods amongst people and at the same time discourages mass consumption.

1.6 Limitations

This study will not focus on the economic/investment aspect as well as some of the functions of the product during the development process, but mostly on the design method in the product development process.

1.7 Company description

HirePadlock is a platform that lets people rent out their own goods to other people who are looking for a specific product to rent. The platform is provided by the HirePadlock system, which consists of the HirePadlock product and the HireProduct app. The physical product is a smart padlock which secures the available asset and acts as a security device, where it can be interacted together with mobile devices (smartphones and/or smartwatches).

The HireProduct app is a market-community app which is meant to be used for customers (rentee and renter). In the app the owner (rentee) can list his product for a specific amount. Once the product has been listed, other customers (renters) can see the listed product and the rental price inside the app. Here they can also choose to contact the owner for specific questions. A calendar will also be available to choose the date the renter would like to rent the product.



The purpose of the whole platform is that it gives people an opportunity to offer their goods/assets on the market to be hired. By hiring out their goods, the owner can also make an earning on a product that he/she may not be using. This could be anything from a boat or a bike to sports equipment such as snowboards/skis or even tennis racquets. People usually have stuff, which is not frequently used, sitting somewhere in their home, garage, basement, or a storage room. So instead of having these things laying around and collecting dust, you can instead let other people use them while also getting paid for letting them use it. This also has a good impact on the environment, because it discourages people from buying the product and instead letting them use existing products. Which hopefully leads to less consumption.

The idea here is that the owner who wants to rent out their goods buys the HirePadlock smart padlock, the padlock will then be used to lock the specific product/products they would like to rent out. The owner can list their product on the HireProduct app for a specific price per hour. The customer who wants to rent the product shall be able to choose how long he/she wants to rent it. There should also be a calendar function, which is one of the more important parts of the HirePadlock app. By using the calendar, people can book the listed items on a specific date when they would like to hire it. The customer pays for the product they want to hire through the app with a credit card, and the owner receives the paid amount. When the payment is done, the customer will get access to the product. Inside the app the customer can see where the product is located, once the customer gets near the product, he/she will need to have their phone with them in range to unlock the padlock through the Bluetooth/NFC function.

The whole platform can be compared to websites like Hygglo and Blocket. It is more like Hygglo, while Blocket is more focused on selling products and Hygglo on renting (Blocket 2022, Hygglo 2022). However, the benefits of the HirePadlock are that they offer the flexibility which none of these websites offers yet. The flexibility here is that there is no need for the customers to meet up face to face. Once the renter has listed the product, the rentee will see the location of the product when the person pays for it. When the location is revealed the rentee can find the product the person wants to rent, which is attached to the HirePadlock product (the smart padlock). By using their smartphone, the rentee can unlock the padlock inside the app through the Bluetooth/NFC function.

These sites have something in common. Buying used items leads to a more climate and environmentally friendly purchase (Blocket 2022). The same goes for renting the products (Fräsén, 2019). By extending the lifetime on products that have already been purchased, people can decrease new production and the usage of packaging as well as waste and transportation. Because these mentioned parts lead to greenhouse gas emissions. Some of the products that people buy contain plastics, for example electronics, toys, and home decoration. Avoiding buying new products means less materials like plastics will be produced which leads to a more sustainable development (Blocket 2022).



2 Theory

This part covers a deeper description for the relevant theories included in the report.

2.1 Smart padlocks

A Smart padlock is a padlock that uses the Bluetooth connection to interact with the padlock (Delaney, 2022). The material of these padlocks is usually as tough as any other regular padlock, but with the advantage that you can unlock it easily with a tap from your phone. The smart padlock is an upgraded version of the normal padlock, which uses the latest technology (Bizacco, Rawes & Lacoma, 2022). Digital entry codes can be created by using the app in your smartphone which is designed for the specific padlock. Together with a paired Bluetooth connection it offers a secure way to lock the possessions.

2.2 Different competitors

A competitor within the business is someone who can offer the same or identical goods or services to the customers (Commerce Commission New Zealand 2022). The competitor can be a person, business, organization, or a team who competes against the other company etc (Market Business News 2022).

This section of the theory contains companies who could be possible competitors when it comes to the HirePadlock platform, which is the product and the service HirePadlock offers.

2.2.1 Igloohome padlock

The Igloohome is a padlock that can be used for several different purposes (Igloohome 2022). It allows the user to secure its assets or property with a smart function, which means that it can interact with the smart phones. It has a built in Bluetooth and a numerical keypad so the user can unlock it with a PIN code or through the Bluetooth by having the smartphone in range, see figure 1. The padlock's function is mainly based on the app. Inside the app the user can create a PIN code for the device, which allows the user to either create a temporary code or a permanent one. The PIN code can be shared with family and friends and does not require you to have your smartphone with you. If the user doesn't want to use the PIN code, he can unlock it by using the Bluetooth from the phone. From the app the key owner can create several digital keys which can be shared to friends who have the app to unlock the padlock with the Bluetooth function. Another important feature the padlock has is the possibility to synchronize it with Airbnb. This means that as a host you can generate pin codes for new guests.

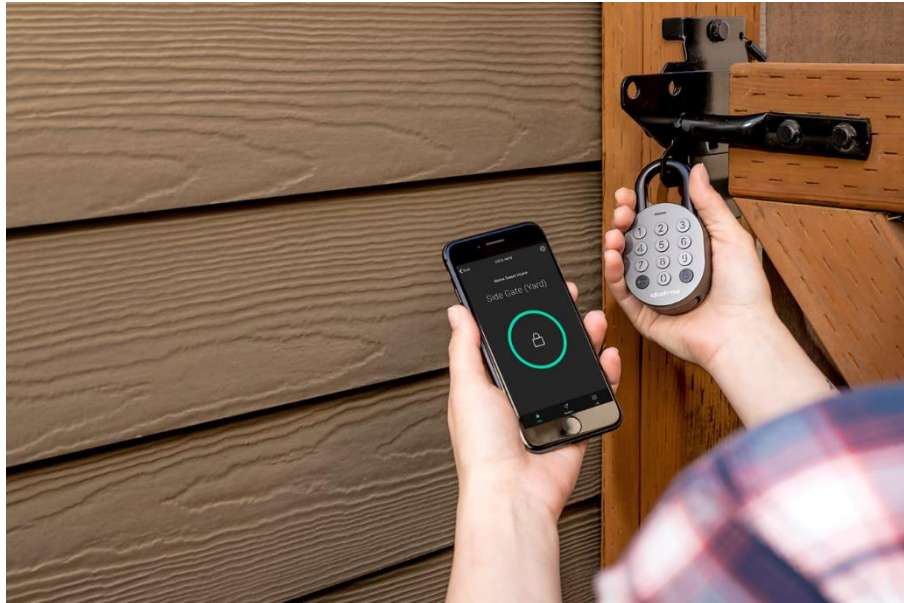


Figure 1 The Igloohome padlock together with the smartphone app (Igloohome, 2022)

2.2.2 Master Lock Bluetooth outdoor padlock

Master Lock is a brand that produces padlocks, which have been on the market during the last century. Their product “Master Lock 4401DLH Bluetooth padlock” is one of their latest products in the “smart” category, see figure 2. The lock has the shape of a normal padlock but is secure and comes with smart features. This one is the outdoor version, and it is water resistant and has a rubber cover. It also has an extra-long shackle, which makes it great for outdoor equipment (Malmlund, 2021). The shackle is made of boron carbide, which makes the shackle extra hard to cut through. The body is made of metal and is not that strong, however. This was tried out by Bosnianbill from Locklab on their YouTube channel, where he had no trouble opening the body by using force with a hammer.

When it comes to using the padlock, it offers several features. It is easy to use and comes with a built in Bluetooth function, it also comes with an app where you can change how the phone should interact with the padlock and it also allows you to modify the manual entry code. Another great feature is that the app allows you to share the padlock with other people by scheduling the time when it should be used. Here below are some of the pros and cons of the product:

Pros:

- Water resistant
- Battery life is decent
- The padlock can be shared with other people through the app with a schedule



Cons:

- All users must have the app installed and a username and password
- Easy to open with the use of force
- High price tag



Figure 2 Master Lock outdoor padlock being used outside (Masterlock, 2022)

2.2.3 Blocket

Blocket is a Swedish website which also is Sweden's largest marketplace (Blocket 2022). Blocket can be defined as a marketplace or a platform where people can buy, sell, rent, and hire different things. On the website people can find almost anything they need, ranging from furniture and clothing to cars and jobs.

By using Blocket people contribute to a positive development of the society. Most of the items that sell on the website are used items, which saves the environment and allows more environmentally friendly consumption (Blocket 2022).

2.2.4 Hygglo

Hygglo is the largest site in Scandinavia when it comes to renting between private individuals. The website started in 2016 with the motto "things should be used". With Hygglo people can make an earning of the things they don't use, and at the same time rent other things they might need. Hygglo does not charge anything for listing the items on their market website, instead they take a 20% cut off the item once it is rented. Hygglo also manages the insurance, the payment and verification through BankID (Hygglo 2022).

2.3 Product development

Product development (PD) is about all development in such projects that run with the aim that the result, the new product, will be manufactured and presented on the market. The process of running PD projects has developed in industry during the 1990s. Nowadays, most companies have PU manuals that show how PU projects should be derived, and what activities should be performed.

Of course, the conditions for how to plan and drive product development vary greatly between different types of companies, from large organizations to small companies with few co-workers. But there is still a lot in common when it comes to organizing product development in a structured way. The requirement to have an efficient PU process exists in all types of organization (Johannesson. 2013).

2.3.1 Phases of the product development process

A product development process consists of several different phases, see figure 2. Those phases can be completed several times. A valuable effect of structured development work and a specific PU process is that the development process with design decisions is well documented and leads easily to traceability (Johannesson. 2013).

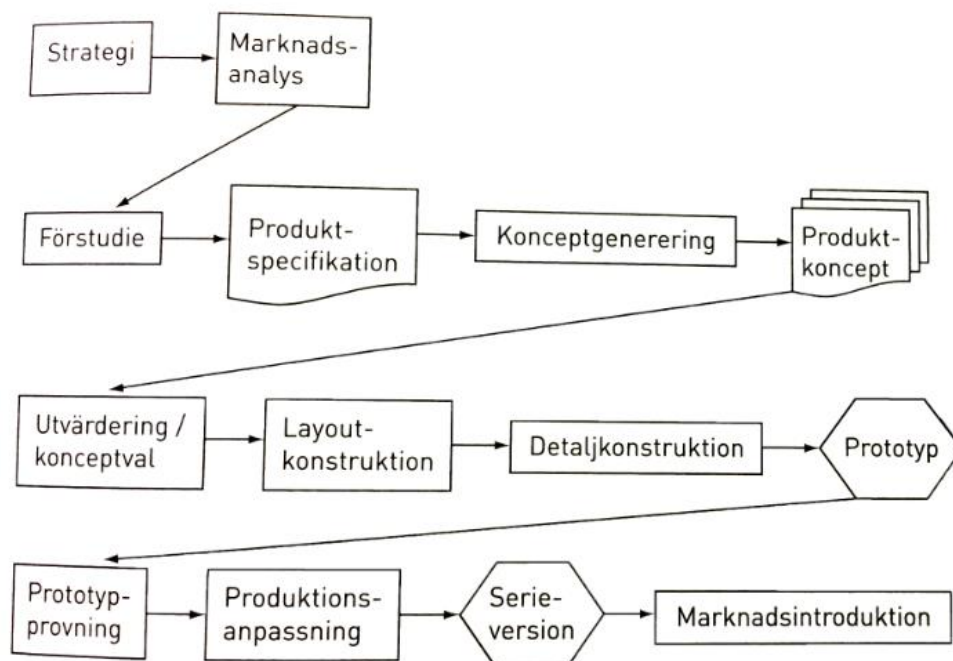


Figure 3. Product development. (Johannesson 2013).



2.3.1.1 Feasibility studies

In the feasibility study, it is important to include different areas of expertise so that the problem is highlighted from different angles. It is important to examine all possible technical solutions and other conditions, so that you do not start a resource-intensive process on incorrect premises. During the feasibility study and concept generation phases, limited resources are invested, but it is at this stage that the cost of the future product is determined, as the total cost is affected during these two phases (Johannesson. 2013).

2.3.1.2 Identifying customer needs

Determining the customer needs is an important part of the product development process. The results that come from the customer needs provide beneficial information which guides the team to create product specifications, creating concepts for the product and to choose the right product for further development (Ulrich, Eppinger and Yang, 2020). The idea behind identifying the customer needs is to establish a high-quality information channel that runs directly between customers and product developers in the target market. This idea is built on the presumption that those who know the details of the products, including engineers and industrial designers, need to communicate with customers and experience the environment in which the product is used.

2.3.1.3 Concept screening using the elimination matrix

The concept screening matrix is a method that is used to select the final concept. The whole idea behind it is to rapidly reduce the number of concepts and to try to improve the winning ones. The screening is done by collecting the customer needs and using these as the selection criteria in the matrix table. The generated concepts are listed in the table in its own column and each concept is assigned a value (Ulrich, Eppinger and Yang, 2020).

2.3.1.4 Product specification

During this phase, the project's results in the product development process are reported, which can be used later as help to arrive at design solutions. The product specification is developed throughout the process in step with the knowledge of the product's final form becoming clearer.

Goal criteria are divided into two categories:

- Criteria that are related to the product's expected function.
- Criteria that set limits for which product solutions are permitted.

The functional criteria are useful in the synthesis to come up with the best solutions, while the restrictive ones can then be used to develop the permitted solutions. Another way to divide the criteria is by:

- Requirements.
- Desires.



The criteria for the requirements must always be met compared to the criteria for the desires, which on the other hand should be fulfilled. (Löfgren 2002).

2.3.1.5 Concept generation, concept evaluation and selection

A concept in the scientific context of construction is the preparation for solving a construction problem. This is described in the following points:

- An estimated preliminary product layout with space estimates
- A preliminary cost estimates
- Descriptions of the principles of the technical solution in text, sketches, block diagrams, wiring diagrams and any physical models etc.
- Description of the product's properties in relation to the product specification.
- Motive for the choice of input sub-solutions.
- Compilation of completed estimates, analyses and experiments with the results obtained.

A concept description does not provide sufficient basis for building a certain prototype, but it is necessary to develop the concept solution further. When selecting a concept, you must think about the best that meets the product specification. This can be achieved by evaluating the developed concepts, however, there may be some difficulties in this, as the value of a solution is affected by many different properties. Properties have varied meanings among stakeholders who value them in different ways. At the same time the ability to measure is based on the property. Some properties can be measured by quantitative methods while others require qualitative analysis to calculate a value. (Löfgren 2002).

2.3.1.6 Configuration and detailed construction

In this phase, the concept is developed into a well-functioning product that meets the criteria from the product specification. Here you go into detail, construct, and specify specific dimensions, materials and describe the product's architecture and layout. The product subsystem must be described here, how their functionality is related to each other. The layout describes how the different details relate to each other in the room (Löfgren 2002).

2.3.1.7 Prototypes

Prototypes are often made virtually in CAD (Computer Aided Design) where both the design of the parts and the layout are tested, also some calculations are made to show how the strength in them is dependent on materials.

Another way prototypes can be made is the physical way, where there may be different reasons for the prototype's production.



The production of the prototype can have different causes why they were developed, which is the following:

- Mock-up prototype provides shape, properties, and colour.
- Function prototype showing new technical solution.
- Zero series prototype used for series production.
- Prototype for loading and testing of the product's ability in strength and what the result will be when the product is overloaded (Löfgren 2002).

2.3.1.8 Manufacturing customization

Prototypes are usually not manufactured directly for uninterrupted production with ordinary means of production, especially not if the product is then to be produced in series in larger quantities. Prototypes receive their final treatment to be able to be manufactured efficiently at the end of the production process in the final design phase. This is done so that the prototype will go through the process and will be assembled and manufactured with the intended equipment, interaction correct and economically correct. This must be in relation to the product specification described at the beginning of the project. These aspects must be considered throughout the design process, but final adjustment will be made during this step (Löfgren. 2002).

2.4 Design

The word design comes from the Latin word, designare, which means to mark out and decide. Other words for design can be shape or pattern. Industrial design is often about the work of designing industrially manufactured products. If you are involved in the process from start to finish. It is about product development, where it is the design of more complicated, technical products that are produced in large series. There are often many people involved in the process, for example, technicians, ergonomists and persons in production and the market. It also includes many theoretical compilations such as requirements specifications, functional analysis, and surveys. Today a lot of designers use computers and custom software for design, they work with 3D modelling which contains mathematical description of form and components. Designer also works to develop, and quality assure service content in the product. According to Löfgren, B, the requirements for design can be described: "A product that has a good design expresses the product's uniqueness. When you see a product, you should not have to ask yourself what it is or how it should be used, it should be clear" (Löfgren. 2002).

2.5 Market introduction and aftermarket

The designer's digital images are used in different ways than just internally in the organization for the basis of decisions. The images can be used to get customers' inputs in their opinion about different concepts.

They can also be used in a market introduction, which shows an early and new technology and presents themselves as innovative as a company.



Some problems can arise later if you make the last changes, and the product would not eventually look like as previously shown.

There are a few different documents that need to be developed for market function:

- Product information sheets or product websites.
- User manuals for operation and maintenance.
- packaging.
- Technical basis for press releases in relation to market introduction.
- Technical basis for trade fairs and product introduction.
- Spare parts catalogues.
- Service manuals for service personnel.
- Training courses for our own sales organization, retailers, and customers.
- Environmental declaration.
- Disassembly and recycling instructions (Johannesson 2013).

2.6 Entrepreneurship

Entrepreneurship is about the desire to start a new business. It is based on the concept of creating a business idea and running the company in such a way that you make a profit from it. It is about daring to take risks in the business world.

Entrepreneurship consists of various forms that play important roles in the expanding global market. An entrepreneur is a person who works hard for his own sake and often on his own, at least in the beginning. How to start an entrepreneurship can be different, depending on the different types of entrepreneurs that exist. It can be created, for example, by a person starting a small project alongside its full-time job, where the project grows and then becomes the person's main business. It can also be created by the person freelancing or investing everything the person has in a new company (Ries 2011).

Entrepreneurship plays an important role in the business market for various reasons which are the following:

- It creates different employment opportunities.
- Innovative entrepreneurship leads to a higher standard of living for people.
- Positive impact it creates on society and its development.
- It contributes to an improved standard of living for the individual by increasing income.
- In addition, it supports research and development (Ries 2011).

2.7 Ecological and social sustainability

The Brundtland report defines sustainable development as "Sustainable development is a development that meets today's needs without risking future generations' opportunities to meet their needs." The concept of sustainability is not just about important issues such as climate and environment, but it is broader than that. The concept Triple bottom line: People, planet and profit was launched in



1994, which has since begun to be used as a framework for reporting on sustainability work. Sustainable development contributes to a good financial result. It also requires good development for the planet and humans (Tomasson, 2013).

2.5.1 Ecological sustainability

Ecological sustainability usually sets the framework for the other two sustainability components: social and economic sustainability. This area is about the earth's ecosystem and maintaining its functions in the long term, for example keeping water clean, food and energy production, climate regulation and recreation. In business, it is about treating and reducing the imprint a company makes in its value chain, but it is also about, for example, resource availability (Tomasson, 2013).

2.5.2 Social sustainability

Social sustainability is based on people's living conditions in society, such as health, security, education, justice, and the exercise of power, and improving them. It can also be about how these living conditions are distributed between people according to the views of both human rights, the UN, and the global goals of the UN. For example, you as a manager are social sustainability about making demands on the conditions in the business chain and meeting compliance with policies that protect human rights and fair living conditions. It is also about the health and equality of employees in the company (Tomasson, 2013).



3 Methodology

The methodology section contains the research design which will be used to approach the whole degree project, the method selection and how relevant data will be used. It also explains the chosen sample method and how the research quality and ethics will be handled.

3.1 Research design

The research process can be described as a scientific study where one goes from start to finish (Säfsten & Gustavsson, 2019). An important prerequisite for this step is that the researcher has a certain insight in the field of knowledge. Therefore, it is important that the researcher makes a careful review of the literature. First, a problem is identified, then the purpose and issues are formulated and then a plan is made of how the survey will be conducted. The researcher then collects information for the work, the information is processed and analysed. Afterwards the researcher can produce a result that answers the questions, then the discussion is set in, and a conclusion of the work can be drawn.

This project's research design will use Design Research Methodology (DRM), see figure 3. DRM is a framework that deals with the entire research process and can be seen as a general research approach for different research methods and data collection. DRM is based on Design Research, which is about producing different types of support to promote and improve process and product development and to provide a deeper insight into the process itself for development.

DRM is an iterative process that can be divided into four steps. It is not always necessary to implement all the steps during the process, nor do they need to be done in a specific order. The four steps consist of the following:

1. Clarification of research task - Here, purpose and goals are created based on assumptions, which is supplemented with relevant theory.
2. Descriptive study 1 - Contains a thorough review of the literature that is related to the purpose and goals to get a better picture in the subject, this can be supplemented with empirical studies.
3. Prescriptive study - Uses a deeper understanding of the current situation to solve the future problem and should include a description or ideas of how changes can be made to solve the problem.
4. Descriptive study 2 - An empirical study is carried out, the idea or concept is evaluated and checked so that it agrees with the purpose and goals.

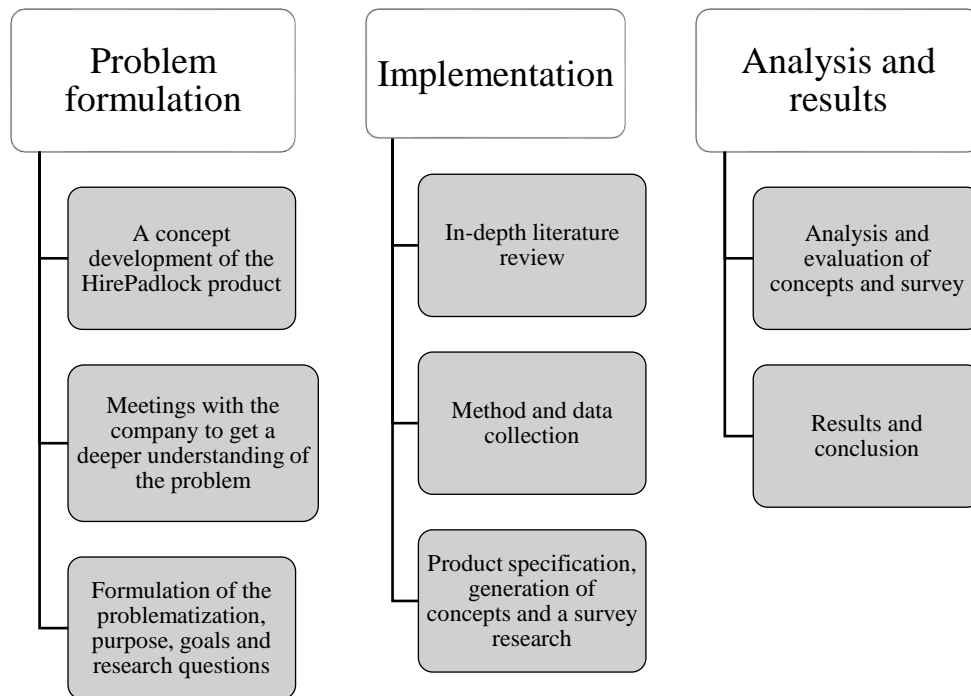


Figure 4. Research design.

3.2 Method selection

A method can be described as a certain strategy used to gain more knowledge about something that is unknown (Blomkvist & Hallin, 2015). When it comes to the research method, there are two common methods used, qualitative method and quantitative method.

When a quantitative study is carried out, you usually want to collect quantitative data, which means collect information in larger quantities. The quantitative method is characterized by its characteristic properties such as a high degree of standardization and formalization, which contributes to a lower flexibility.

The qualitative method can be defined as a data collection method. You immerse yourself in a certain area where you collect data, which can be done through interviews and observations. Unlike the quantitative method, the qualitative method has a low degree of standardization and formalization, but a higher degree of flexibility.



Data collection is a method of collecting information for the study. When doing a data collection, these are usually divided into two groups: Primary data and secondary data. Collecting primary data means that you get the information through observations, measurements, interviews, surveys, and simulations. Secondary data can be obtained through document studies such as books and articles.

3.2.1 Selection of data collection

This study will use both qualitative and quantitative data collection methods. The information for the study will be obtained through regular meetings with the company to get a deeper understanding of the problem, but also through the collection of documents and through surveys. This means that the primary data will be collected through the company by having regular video meetings and through a survey. The secondary data will be collected through a literature search, i.e., finding relevant literature to the theory section such as books, articles and other materials that affect the project.

3.3 Sample

There are two different ways the sample can be done: random and non-random (Blomkvist & Hallin, 2015). When a random sample is made, a sample is selected from an entire population. The selection is made either without systematics or with systematics. A systematic selection is made by selecting, for example, every tenth, twentieth, or thirtieth individual or object.

A non-random sample means that you select the sources that are easiest to obtain, a so-called convenience sample. For example, this could be people who are interested in participating in the survey. The disadvantage of this sample is that no conclusions can be drawn based on statistics.

This study will use a non-random sample. This method is best suited as there is not much previous research and previous experiments on this problem. The information will be collected from the company through interviews but also through surveys with people who are most easily accessible.

3.4 Survey

A questionnaire survey is a survey that can be used as an alternative to an interview to find out people's perceptions and moods. Anyone who participates in the survey and answers the questions notes their answers either in paper form or via computer / tablet. A survey can be used to study people's perception, thoughts, or point of view by asking the same questions to usually a certain number of people or a specific target group. It can also be used to do some evaluations.

Benefits of using a survey:

- The survey can be performed on a large sample with relatively little work effort before processing starts.
- The survey can be conducted within a large geographical area.
- The survey can be focused on a specific target group.



- Those who participate in the survey can answer and think about questions at their own pace.
- The question formulations are usually standardized, i.e., both questions and answer alternatives are the same for everyone who participates in the survey.
- Those who answer the questions do it themselves, which reduces the risk of influence from e.g., an interviewer

There are many structures to follow when formulating questions for forms. Below we follow some structures:

- The language of the survey must be adapted to its target group.
- Questions should not be formulated in a leading way.
- Knowledge questions should not be included in the survey.
- Make sure that the questions should have the same consequential direction on the answer alternatives.
- A good tip is to test your questions on one or more individuals in your environment before using them in practice (Trost 2001).

3.5 Research quality and ethics

For a study to have a high research quality, validity and reliability are usually discussed (Säfsten & Gustavsson, 2019). These two concepts are dependent on each other. If the study has high validity, the reliability will also be high. However, one cannot say the same thing about the opposite, a high reliability does not mean that the validity will be high. Validity can be described as the results obtained being valid, that what is to be examined corresponds to the measurement. Reliability is about credibility, meaning that the measurement can be repeated with the same result.

To achieve high validity and reliability for this study, each step during the study will be reported in the degree project. Certain material comes directly from the company. The literature will be carefully reviewed with the correct source reference.

When writing a degree project, one is expected to proceed in a certain ethical way. If the degree project is carried out on behalf of a company, this means that one must act in a way that does not affect the company negatively (Blomkvist & Hallin, 2015). Therefore, it is important that the researcher reflects on how that person has acted in certain sections of the essay.

Ethics is about following certain rules when it comes to a scientific essay, in a way where no one is harmed by the work. This means that norms for the scientific work are followed once the work is presented both orally and in writing, so that others can see that the researcher has chosen a neutral side and thus make a correct assessment of the result. Therefore, it is very important that source references are made correctly.



A certain research ethic is expected to be followed in the implementation of a degree project. According to Blomkvist and Hallin (2015), there are four different main requirements that a scientific work must meet, these are:

The information requirement - Means that the persons being studied must be informed of the purpose of the study, which can be done through an interview or a survey.

The consent requirement - The persons being studied must give permission to be studied.

The requirement of confidentiality - The material collected must be treated confidentially in such a way that it cannot be shared freely.

The use requirement - The collected material may only be used for what has been informed that the study is about.

All these requirements are extremely important when a project is done through a company. During the implementation of this degree project different data will be considered. Therefore, contact will be made with the company to find out their ethical guidelines. This will be done to make sure that no parties are harmed.



4 Implementation

This part of the project contains the implementation, which means the product development process together with the technical feasibility report, the survey, and the value proposition canvas.

4.1 Product development process

This section follows the product development process that is within the project. An important step for the process is to find out about the customer's needs. By collecting the customer's needs the process can then move on to collecting or setting the requirements and developing a concept for the product.

4.1.1 Customer needs

To be able to come up with ideas how the padlock should look, it is important to gather information about the desired design. This can be done by collecting the customer needs, and by looking up competitors on the market. The customer will in this case be the HirePadlock company, they will be providing some of the design requirements that are needed to develop the concepts.

When setting the requirements there are several factors which need to be considered. The product should not have too many advanced and fancy features/looks. Having this would result in a high production cost which would then lead to a high retail price for the customers buying the product. Another important thing to think about is the users and the environment it will be used in. The users can be anything from people who do sports (indoor), where the padlock might be needed to use as a gym locker, or it could be used outside where it's attached to a boat. Which brings up several questions like: how big should it be? Should it be water resistant (because of the outdoor usage)?

The company also gave the students the freedom to come up with suggested requirements themselves. Which led to the students discussing the requirements together with the company. However, there were some requirements that the company already had proposed. These requirements are presented down below.

4.1.1.1 Design requirements

- The padlock should be the size of a smartphone, but thicker.
- It should be simple and easy to use
- The shackle should be made of hardened steel
- On the outside it should have some symbols like Wi-Fi, Bluetooth, and NFC. These symbols indicate that the padlock has the features.
- A background colour must appear on the display screen that adjusts to the lock's state: available to be rented (green light) and a red light when it's not available. This condition should be visible when you press the big button in the centre for a short period.
- Some small LED lights must be added to show the locks 'connectivity state.
- A charge rate that shows the hour rate, which could be an extra idea to be appearing on the screen.



4.1.2 Functional and non-functional requirements

The customer needs together with the students' own suggestions were then sorted and divided into functional and non-functional requirements. These are the functional requirements for the HirePadlock product. They have been given an ID, a description, and a priority. The high priority indicates that these are the important ones which need to be fulfilled to have the HirePadlock platform working.

Functional requirements		
Functional Requirement ID	Description	Priority: High (H), Medium (M), Low (L)
FR01	The padlock should be traceable	H
FR02	The padlock shall have a Bluetooth connection (to unlock)	H
FR03	The padlock shall have an NFC connection (to unlock)	M
FR04	The padlock shall have a green/red light which indicates its state (available/not available)	H
FR05	The padlock shall have long lasting batteries	H
FR06	The padlock shall have a display	H
FR07	The padlock shall have solar cells (charging)	L

Table 1 Functional requirements.

The functional requirements that are listed in the table have been carefully selected, and all these requirements serve a purpose to have the platform working.

- **FR01 “The padlock should be traceable”**
The tracing has been chosen because it is an important function that needs to be there to have the platform working. This feature helps the customers find the location of the product they want to rent, and lets the owner know where it is being used once it is rented.
- **FR02 “The padlock shall have a Bluetooth connection (to unlock)”**
This is another important feature that is a high priority. The Bluetooth connection will be used to access the padlock when it is locked by using the smartphone. The customer that rents the product gets access to it during the rented period.



- **FR03 “The padlock shall have an NFC connection (to unlock)”** This feature is not a high priority but could still be used. The NFC connection would be an alternative to the Bluetooth connection.
- **FR04 “The padlock shall have a green/red light which indicates its state (available/not available)”**
Another important feature which is a “must have”. This feature lets customers know that the product is available to be rented (green light), and the red light indicates that it is not available.
- **FR05 “The padlock shall have long lasting batteries”**
The long-lasting batteries are important because of the environment the padlock will be used in. If the padlock will be attached to a boat outside it could mean that it would be sitting there for several months, and because of that it needs to be able to have the energy during this period.
- **FR06 “The padlock shall have a display”**
The display will be there to show different logos, for example Bluetooth or the green/red light. With this feature it lets customers know that it has a Bluetooth function and by displaying the colours green/red it lets customers know if it’s available or not.
- **FR07 “The padlock shall have solar cells (for charging)”**
This could be an optional feature having solar cells that charge the padlock, however this feature would mostly work in the outdoor environment with lots of sun exposure.

These are the non-functional requirements for the HireProduct as well. Like mentioned above the requirements have been given an ID, a description, and a priority. The non-functional requirements have nothing to do with the functionality of the padlock itself, but rather other aspects like design etc.



Nonfunctional requirements		
Nonfunctional Requirement ID	Description	Priority: High (H), Medium (M), Low (L)
NFR01	The padlock shall have an appealing design	H
NFR02	The padlock shall be able to handle certain environments (water and dust resistant)	H
NFR03	The padlock shall be able to withstand a high amount of force	H
NFR04	The manufacturing cost shall be kept as low as possible	L
NFR05	The padlock shall not be bigger than a smartphone	H
NFR06	The padlock shall be easy to carry around	M
NFR07	The usage of the padlock shall contribute to environmentally friendly behavior	M
NFR08	The padlock shall be easy to use	L

Table 2 Non-functional requirements.

- **NFR01 “The padlock shall have an appealing design”**
The esthetical design is probably one of the first things a person will look at when they see a product. Because of this, the requirement has been given a high priority.
- **NFR02 “The padlock shall be able to handle certain environments (water and dust resistant)”**
This one is important depending on the environment the padlock will be used in. If the padlock will be attached on the outside to a boat or a bike it needs to be able to handle rainy and colder environments.
- **NFR03 “The padlock shall be able to withstand a high amount of force”**
It is important here to choose a material that can withstand forces against thefts. This means that the best solution would probably be having a metal body and a shackle which is made of steel.
- **NFR04 “The manufacturing cost shall be kept as low as possible”**
Avoiding unnecessary manufacturing costs would be good if possible. To do this it would mean to try to minimize and avoid unnecessary design features that don't provide a lot to the functionality.
- **NFR05 “The padlock shall not be bigger than a smartphone”**
Too big size of the padlock means heavier weight and more material usage. This leads to an unnecessary higher production cost and an extra weight that can be avoided. However, it is important to remember that there must be



enough size inside of it, so it can fit electronics and batteries that are needed.

- **NFR06 “The padlock shall be easy to carry around”**
This means reducing the weight of the padlock if possible. To reduce the weight one can, choose a material that is lighter.
- **NFR07 “The usage of the padlock shall contribute to environmentally friendly behaviour”**
By using the platform as intended, would mean to reduce the production of unnecessary products that lead to the greenhouse effect. This is something that the padlock and the HirePadlock platform hopefully will contribute to.
- **NFR08 “The padlock shall be easy to use”**
To have a padlock that is easy to use would mean easy ways to navigate through the padlock with the phone and inside the app etc. However, this is a requirement where the group might not have a big impact on, since the development is towards the hardware and not the software.

4.1.3 Concept generation

The generated concepts were done using computer aided design (CAD). By collecting the requirements for the desired design from the company and getting inspiration from other smart padlocks, three concepts could be generated.

Generating concept 1:

The design on concept number one was inspired by the Igloohome Padlock. The body is more rounded and shorter in length. It has a longer and thicker shackle with a curvature on the top. The curved feature on the top makes it slightly wider which means that it makes it easier to lock things that need a bit bigger space. It has an LCD screen where it displays the Bluetooth logo and the NFC, it also displays the availability with a green/red colour and is powered on through a touch on the screen.



Figure 5. A concept design (1).



Generating concept 2

The second concept has an interesting design. It has an LCD screen that displays the state of the padlock (available/not available). This concept however has too many buttons which might make it more difficult to use.



Figure 6. A concept design (2).

Generating concept 3

The third concept is like the second concept. It has an LCD screen that displays the state of the padlock (available/not available). Besides from the screen it also has two coloured dots on top of it, which also displays the state of the padlock. It has all the needed logos, which are wi-fi, Bluetooth and Nfc, it also has a physical button to power it on/off.



Figure 7. A concept design (3).

4.1.4 Concept selection

The concept selection is done by using the elimination matrix. In the elimination matrix, most of the attributes will be taken from the design requirements. The concept selection focuses mostly on the esthetical design, and therefore some of the functional and non-functional- requirements will not be taken into consideration during the selection. This is because of the group's limitations, where the focus is more on the design.

The most important attributes were used in the elimination matrix. A “+” was given if the concept had an attribute that was better than the baseline, a “-” was given if it scored worse than the baseline and a “0” if it scored the same as the baseline, see table 3. This resulted in Concept 3 (Figure 7) being the winner that scored the highest points, which also was the final concept that was chosen.

		Alternatives						
Criteria	Baseline	Concept 1	Concept 2	Concept 3				
Appealing design	0	-	0	0				
Simple in terms of design	0	-	-	+				
Have a Wi-Fi, bluetooth and NFC symbol	0	0	0	0				
Display that shows various attributes	0	0	0	+				
Totals		-2	-1	2				
Rank		3	2	1				

Table 3 Elimination matrix

4.2 Technical feasibility study

To get a better understanding of how a smart padlock is built, it is important to find out what components are inside of it. This can be done in several different ways, one way could be to go to the manufacturing company and ask them straight away. Another option could be to buy the physical padlock and disassemble it to find out what is inside of it.

In this study, experts within the electrical engineering field did a teardown of the smart padlock “Masterlock Bluetooth Padlock 4400D” (Figure 8). The article was posted on “All About Circuits” which is an online community for electrical engineers (All About Circuits, 2022).



Figure 8 Masterlock Bluetooth Padlock 4400D, (Masterlock, 2022).

4.2.1 Disassembling the padlock

The padlock has a metal body that is made of boron alloy. This makes it more durable and offers high resistance to cutting and sawing. Because of the construction, the padlock had to be disassembled by drilling holes in the steel rivets (Hughes, 2018).



Figure 9 The disassembled padlock (Hughes, 2018)

4.2.2 Inside the padlock

What can be seen on the picture above (figure 9) is the shackle, some mechanical parts like screws, a button for navigating the padlock, a 3-volt battery and the electronics.

4.2.2.1 Electronics inside the padlock

When it comes to the electronics inside the padlock, there are two different types of chipsets that can be found there. These are so called microchips, and both are manufactured by the company Texas Instruments. These two types are:

- MSP430FR5949, which is a 16-bit microcontroller. This is the main chip and acts as the brain of the whole padlock. It handles the button presses, communicates with the other chip, and turns on the LED light (Hughes, 2018). One of the benefits with the chip is that it has an ultra-low power system, which means that it offers a good amount of performance at a reduced energy level. The chip can be bought directly from the company's website for as low as 3,45€ (Texas Instruments, 2022).

- CC2541F256 is a low energy Bluetooth chip that communicates directly with the main chip and with the phone app. It lets people update the padlock when needed and take control of the lock (Hughes, 2018). The Bluetooth chip can be bought directly from the company's website for as low as 3,61€ (Texas Instruments, 2022).

4.3 The Value proposition Canvas

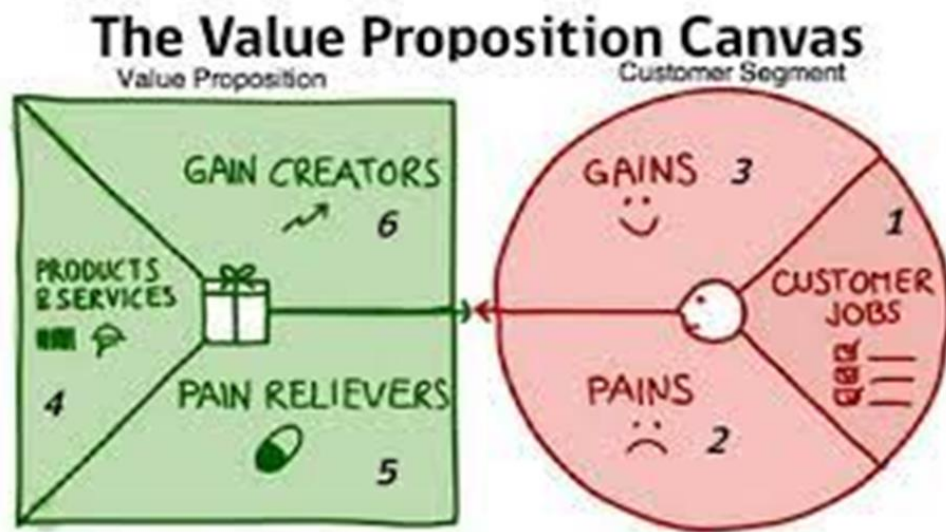


Figure 10. A framework of the value proposition model. (Shakkarwar 2020).

The value proposition canvas is a useful tool that helps in verifying with real customers. It is also used to really understand the customers you talk to in connection with interviews. This framework of the value proposition connects between the customer (inside the circle with three elements: customers jobs, customers pains, and customers gains) with the value propositioned or offered (inside the box with three elements: product/service, preventing problems, and gaining creators) (Shakkarwar 2020).

Let's take a closer look at the customer section. This section is divided into three main elements to fully understand the customer, the tasks to be accomplished, the gains and the problems.

1: Customer Division - Customer Gains

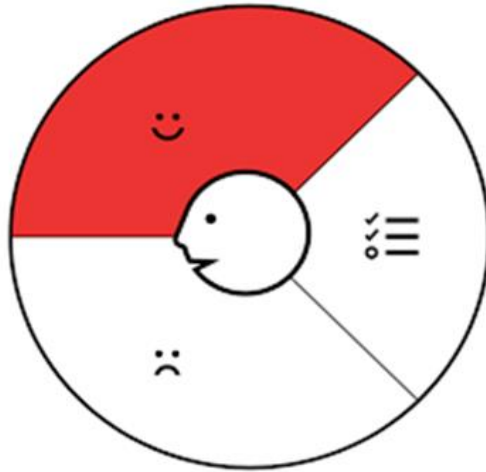


Figure 11 Customer Division - Customer Gains. (Shakkarwar 2020).

After identifying what the customers want and what they suffer from, you arrive at what the customers want to gain. Gains can describe many things like functional tools, social benefits, positive emotions, or cost savings. The following points are some indicators that help determine customer gains:

- Is it offering the minimum needs of customers? Otherwise, the solution will not work.
- Does it exceed expectations and offer extra gains?
- Is it offering new and unconventional gains that the customer was not expecting?

The product will be working as a device that allows for sharing items over a transaction without the need to physically meet. It will provide easier accessibility to try out new hobbies and things over the goods needed for that.

2: Customer division - customer pains

It is about clarifying the problem or pain that is currently experienced by the customer and searching into its details to come up with a list of the problems that the customer suffers from. Below are some examples of the indicators that help identify customer problems:

- functional problems.
- Obstacles.
- Risks.

The potential customers could be worried about both the connectivity or security when people lent/rent goods and they don't physically meet. The solution for this problem can be found by looking at table 1 "Functional requirements". The HirePadlock will be traceable and have a Bluetooth connection to access the padlock when it is locked by using the smartphone. The customer who will rent the

product can get access to it and can also find the location of the product they want to rent it.

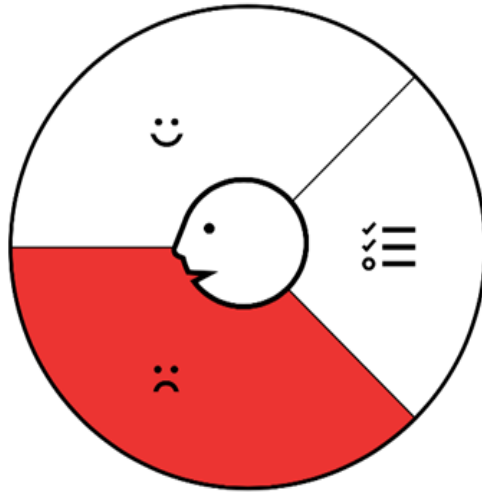


Figure 12 Customer pains. (Shakkarwar 2020).

3: Customer Division - Customer jobs

It is about determining what the customer is trying to do. Some of these tasks are critical and highly important to the customer (depends on his life), while others can be less important. These tasks can be social, functional, emotional, or economic situations.

For example, an economic situation task, improving the status of the customer that has an unstable economic situation issue. The HirePadlock system will help with not needing to make expensive purchases but can find what is out there already. It can decrease mass-consumption and overproduction.

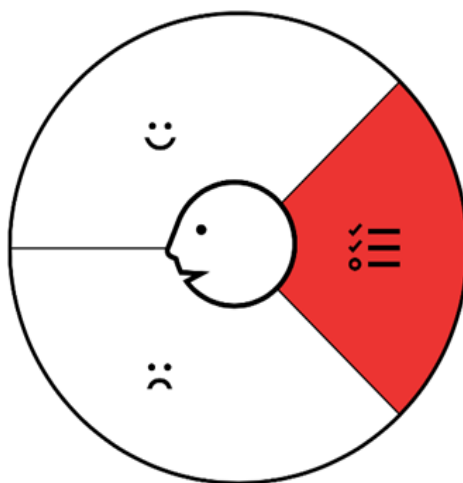


Figure 13 Customer jobs. (Shakkarwar 2020).

The value part also breaks down into three main elements that are required to clearly understand value: products and services, pain relievers, and bring in gains.

1: Value division - Products and Services

It is when you write down a list about the services/ products that your company will provide, especially when it is all at an early stage. Try to keep it simple and provide a minimum number of products and services.

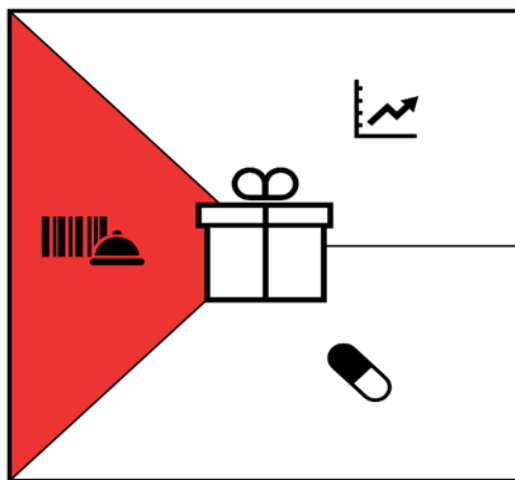


Figure 14 Value division- products and services. (Shakkarwar 2020).

During the idea generation there were a lot of thoughts of different solutions that address the customers' different perspectives. The main questions that have been discussed in the beginning were:

- What is the product that best suits the customer's needs?
- What service best suits the customer's needs?

2: Value division – pain relievers

It is also called “Preventing Problems”, and it’s about looking at the pain the customer is experiencing and thinking about what can be done to properly address each of the problems. Here are some examples:

- Reduce losses.
- Make customers feel better.
- Eliminate obstacles.
- Eliminate the risks.
- Ending social difficulties.



The HirePadlock will work as a community platform that can facilitate and promote to lend/rent out goods and thereby also can promote to rent goods that people would use one time.

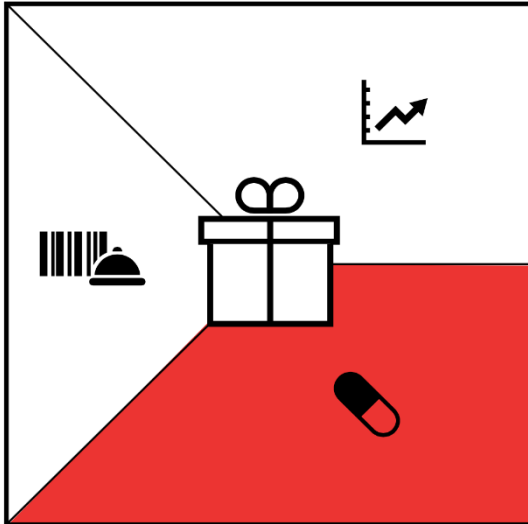


Figure 15 Pain relievers. (Shakkarwar 2020).

3: Value division- bringing gains

This section can also be called "benefits-making". It's about bringing in the benefits that the customer wants to reach, and what can be done to determine each of them correctly. Below are some examples:

- Savings increase.
- Make their work/life easier.
- Create a social benefit.
- Fulfilment of a wish or desire.
- Are you achieving what the customer wants?

As a new company, The HirePadlock are trying to provide more unique and relevant solutions for their customers. With this new hardware device, as it was mentioned earlier the customer would be able to rent/lend out goods and might get the chance to keep competitors away.



Figure 16 Bringing gains. (Shakkarwar 2020).

4.4 Survey plan

How to prepare a questionnaire survey?

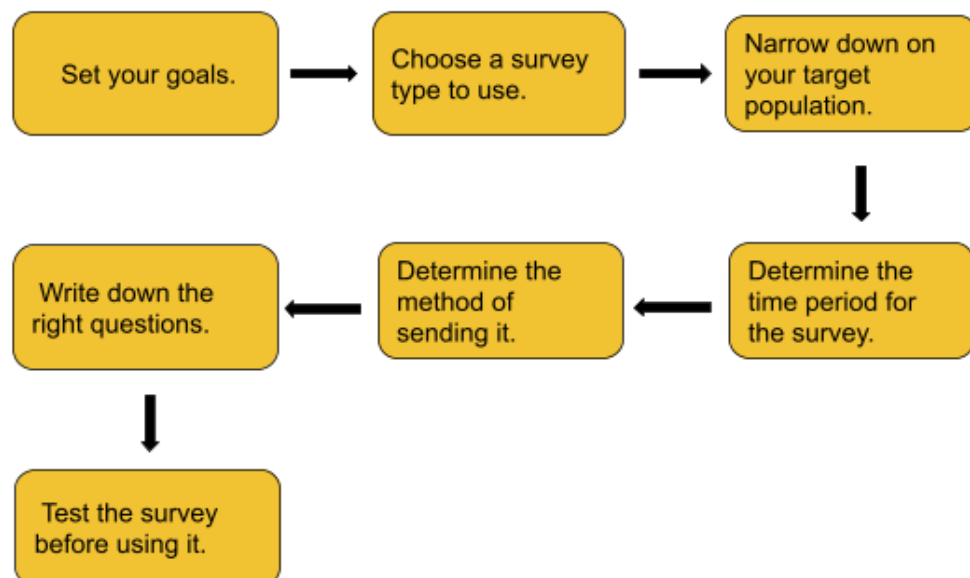


Figure 17. A survey plan design. (Smith 2022).

1: Set your goals



As it was mentioned earlier in the previous section, the questionnaire survey tool is suitable for scientific research related to the study of people's perception, thoughts, or point of view by asking the same questions to usually a certain number of people or a specific target group.

The main goal of this survey is to do market research:

- To find customers' needs.
- To know what is in demand in the market and to analyse it compared to competitors.
- Validate the need for HirePadlock platform and validate the value it creates, that it has benefits for the users and is recognized by potential users.

2: Choosing a survey style

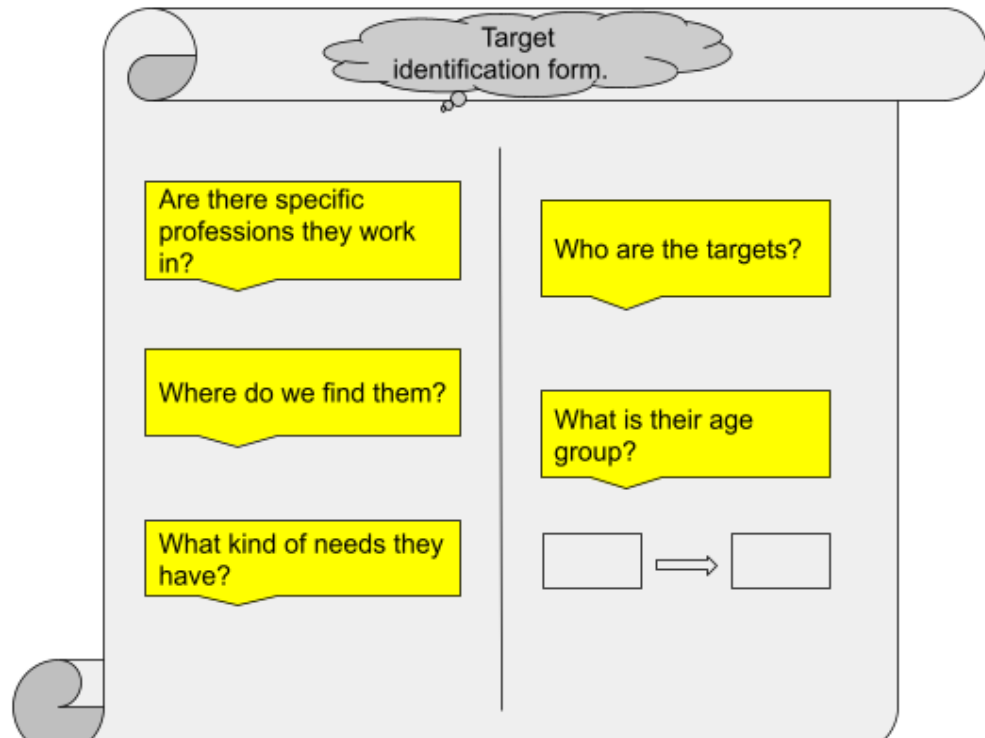
Choosing the type of survey is one of the important things to do when it comes to preparing a survey form, and there are many types, including:

- Opened survey: It is based on a set of questions that require an open answer without being restricted to specific answer forms, and this type can be used by the researcher in the event of a need for a large amount of information about a deep and vague problem that has many dimensions. The participant can also answer and express its opinion extensively. Example of open survey questions: What do you think of our product, The HirePadlock?
- Closed survey: It is sometimes called the specific-answer questionnaire survey, in which the researcher formulates questions with a set of optional answers for each question, and these types of surveys are easy to prepare, and it does not require a large amount of time from the participants to answer. Example of closed survey questions: Do you usually rent out your stuff? Yes (). No ().
- The diversified survey: It is the most popular type of survey to be used when preparing the questionnaire. It requires the formulation of open and closed questions at the same time, and that some of the questions here do not need to be expanded in response. It combines the advantages of a closed and open model at the same time. (Smith 2022).

The diversified survey type will be used in this study, after all the purpose of the research is related to identifying customer needs and the data to be collected are questions aimed at knowing the extent of the impact of presenting a new product to the market.

3: Narrow down on your target population

When it comes to collecting data that is relevant to the research it is important to determine the target of the survey. The figure below shows how a target identification form can look like.



The diagram shows a 'Target identification form' with a light gray background and rounded corners. At the top, a cloud-like shape contains the title 'Target identification form.'. The form is divided into two columns by a vertical line. The left column contains three yellow boxes with the following questions: 'Are there specific professions they work in?', 'Where do we find them?', and 'What kind of needs they have?'. The right column contains two yellow boxes with the questions 'Who are the targets?' and 'What is their age group?'. Below these boxes, there are two empty rectangular boxes connected by a right-pointing arrow, indicating a flow or relationship between the information provided.

Figure 18 A target identification form. (Smith 2022).

Another way to identify potential customers is to divide them into two categories: people who rent out (lessor), and people who rent stuff (lessee) by using many services or companies like Hygglo and Blocket. This kind of study was aimed to create a greater understanding of both individuals' perceptions. A questionnaire survey was considered most appropriate for the participants to be able to express in their own words their opinion on the subject.

4: Determining the time for the survey

The researcher should set a sufficient time for the respondent to understand the nature of the questions, and then answer them, and this is an important matter after preparing the survey form. The researcher should also clarify the importance of this scientific research, what impacts it has on society in general, and how it would be a way to solve an important problem. From this point of view, the respondent prepares to answer in an exemplary and comprehensive way to enrich scientific research. The survey will be conducted by handing out a questionnaire form with 20 questions. The main goal is for the survey to be distributed to about 50-70 people from different areas around the country. It is implemented to see how customers perceive the new product, and a new company on the market. The primary data collection in this section is done through a quantitative survey. The main reason for choosing this method is to be able to ask many people.

5: Determine the method of sending the survey

There are many ways to send the survey, which can be seen down below (figure 19)

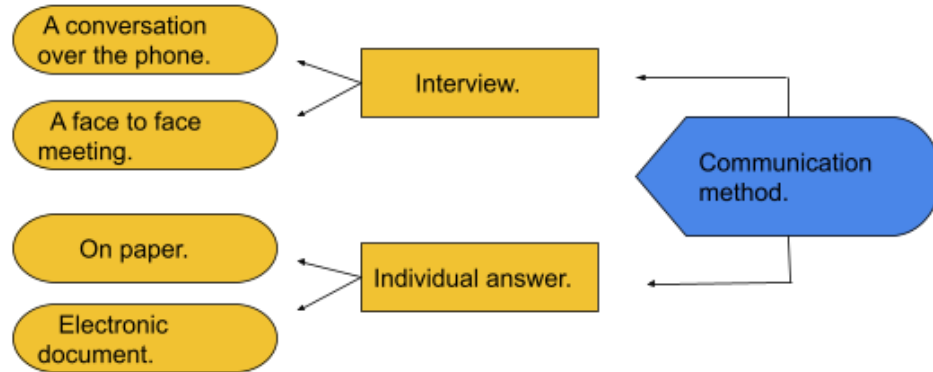


Figure 19. Methods to send the survey to the respondents. (Smith 2022).

In this case the second type, individual answer will be chosen to conduct, where the researcher sends the survey to the respondent (by an online survey) that will be distributed among the target population via email and/or Facebook groups, as they read it by themselves and answer it. An online survey can be created free without any charge. The reason for choosing this type of communication method is to cover as large a group of the target group as possible that live in different parts of the country. The survey will be set up to be answered for a three-week period. The results of the survey will be presented in the form of numbers and comparable diagrams to be able to read collected answers from the survey. It is necessary to test the survey questions on test persons that can respond to the questions before it is distributed. The aim is to test it on a group of five people to ensure the success of the survey, and that there are no negatives in it that may affect the research result in the future.



5 Results

In this part of the study, the results from the generated concepts as well as the results of the survey are presented and analysed based on the main parts of the theories that were written in the theoretical frame of reference.

5.1 Results of the selected concept

The final selected concept is the third concept, see figure 7. It had the most attractive design when it comes to the outer looks. It would fit the company's requirements best since it has the features like a physical button, a screen and a light that shows the initial state of the padlock (available/unavailable) and overall, a very appealing look.

5.2 Survey results

These questions that were chosen to be presented here are those that were relevant in the study's analysis.

1. Do you rent out goods/assets in your daily life? (lessor).

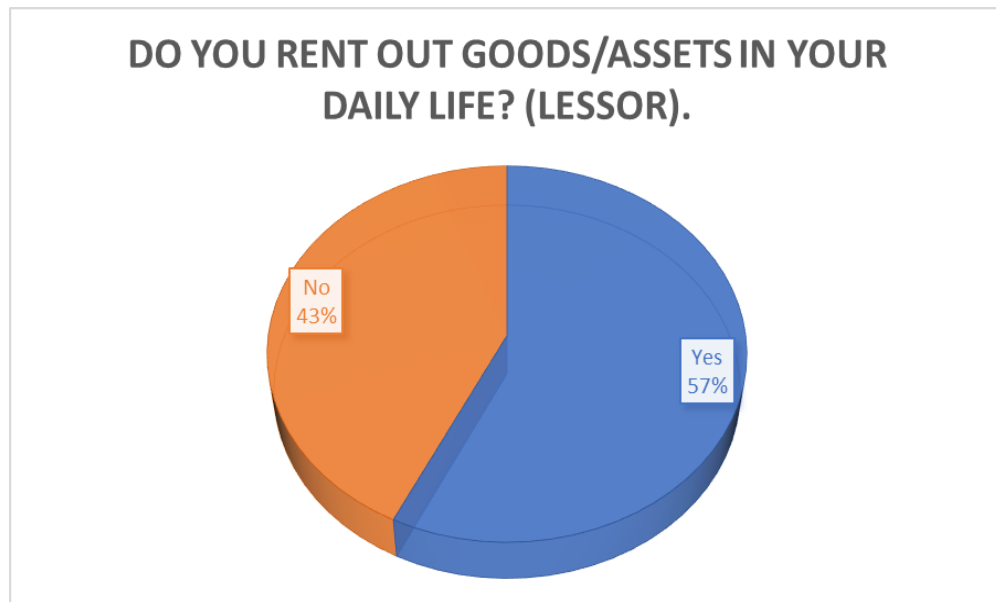


Figure 20 Survey research question

- 2) How do you rent out goods/assets?

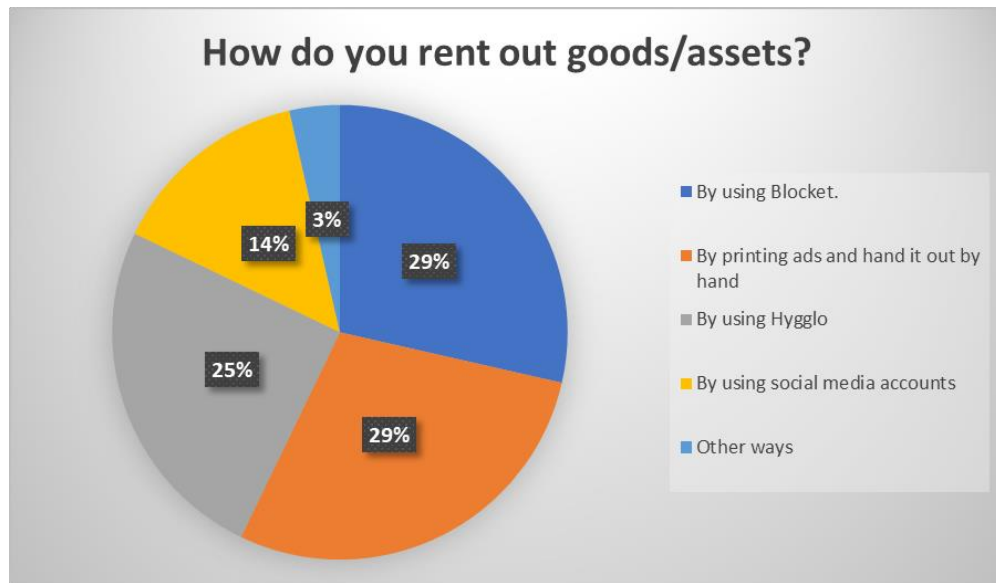


Figure 21 Survey research question

3) How satisfied are you with using these ways/services, like Hygglo or Blocket?

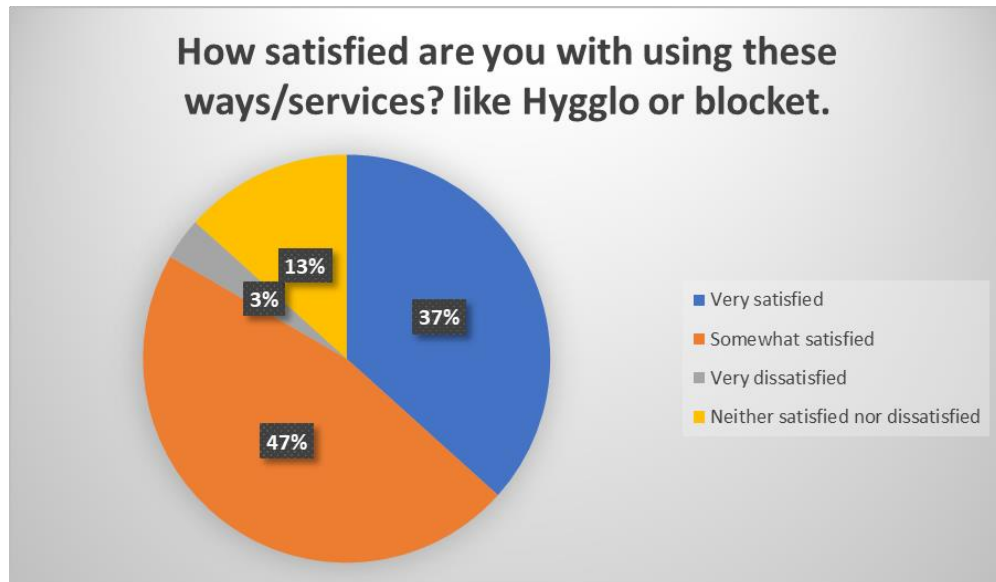


Figure 22 Survey research question

4) Do you rent goods/assets in your daily life? (lessee).



Figure 23 Survey research question

5) How do you rent goods/assets?

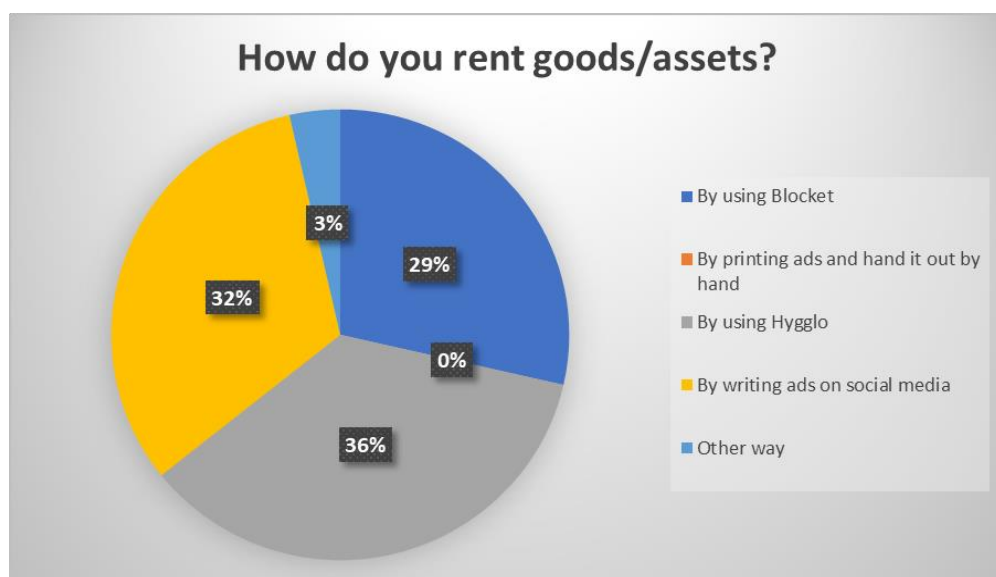


Figure 24 Survey research question

6) How satisfied are you with using these ways/services?

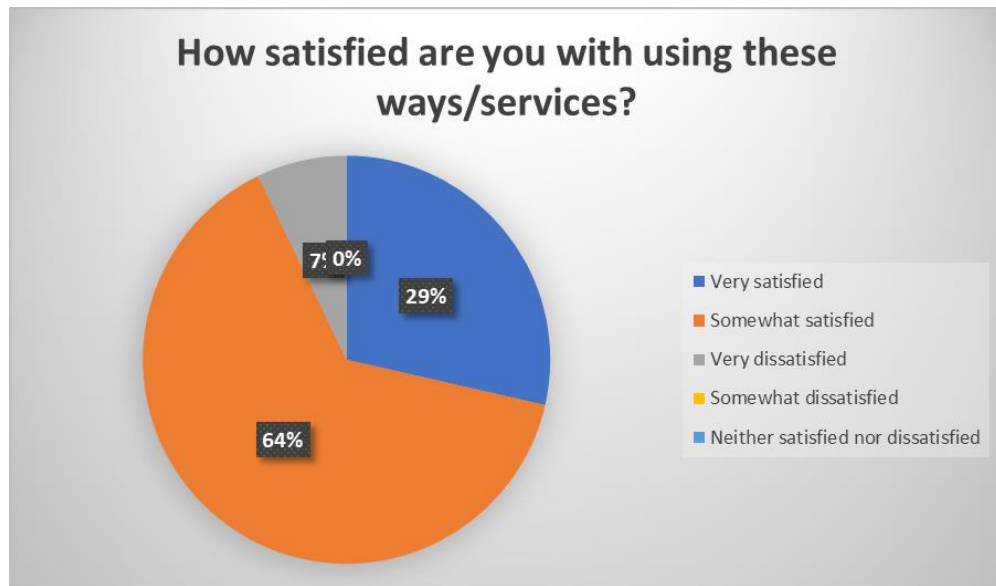


Figure 25 Survey research question

7) How important to you are the following aspects of the functional needs of a padlock?

- Traceable padlock.
- Manual and cheap that helps with not needing to make expensive purchases.
- Suitable for outdoor use by using Bluetooth.
- Connects to a network completely without cables.
- Can be operated with a transponder and Smart card.
- A padlock with long lasting batteries.
- A padlock that can be used when you need to rent/lend out goods without physically meeting.

	Not at all important. (1)		Slightly important. (2)		Important. (3)		Very important. (4)		No opinion. (5)			
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	%	Ø	±
Traceable padlock.	2x	4,17	9x	18,75	10x	20,83	22x	45,83	5x	10,42	3,40	1,05
Manual and cheap that he...	-	-	3x	6,25	17x	35,42	24x	50,00	4x	8,33	3,60	0,74
Suitable for outdoor use by...	-	-	7x	15,22	21x	45,65	10x	21,74	8x	17,39	3,41	0,96
Connects to a network com...	-	-	14x	29,17	19x	39,58	8x	16,67	7x	14,58	3,17	1,02
Can be operated with trans...	2x	4,26	18x	38,30	14x	29,79	4x	8,51	9x	19,15	3,00	1,20
A padlock with long lasting...	-	-	12x	25,00	18x	37,50	14x	29,17	4x	8,33	3,21	0,92
A padlock that can be used..	1x	2,08	20x	41,67	15x	31,25	6x	12,50	6x	12,50	2,92	1,07

Antimetiska medelvärde (Ø)

Standard deviation (±)

Table 4 Different research questions with several alternatives sorted in a table



8) Our company is about to introduce a new product "Hire padlock" that has affordable features and unique solutions, like Bluetooth, Wi-Fi on its display and with long lasting batteries. This product can easily be traceable and is water and dust resistant. It provides easier accessibility to try out new hobbies and things over the goods needed for that. This system helps with not needing to make expensive purchases but finds what is out there already: it lowers mass-consumption and overproduction. And it gives you the ability to rent/lend out goods. When you read about our product, which of the following words would you use to describe our product?

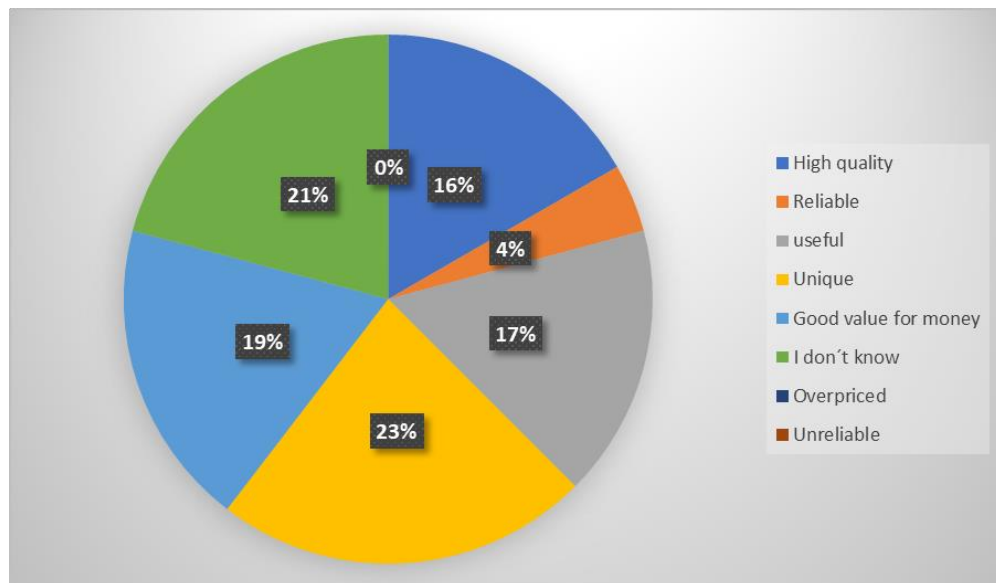


Figure 26 Survey research question

9) Which of the following are reasons that you might purchase our product?

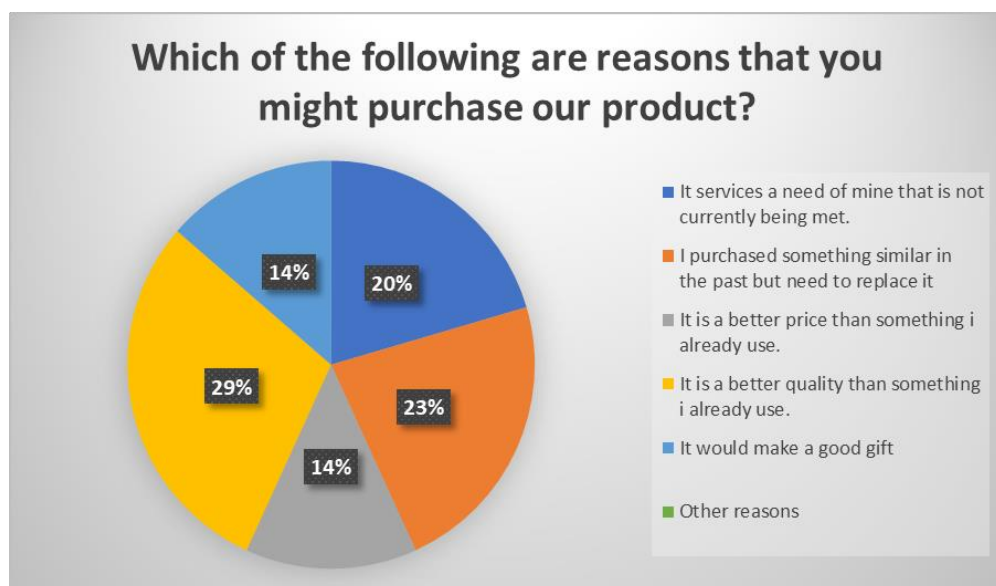


Figure 27 Survey research question



10) How does this product compare to similar products you might use?

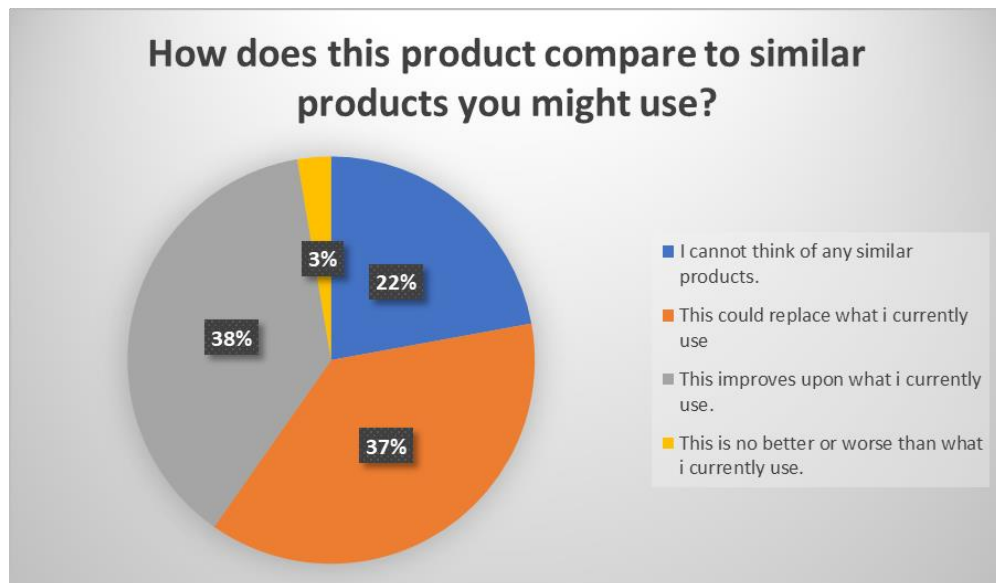


Figure 28 Survey research question

11) What is your gender?

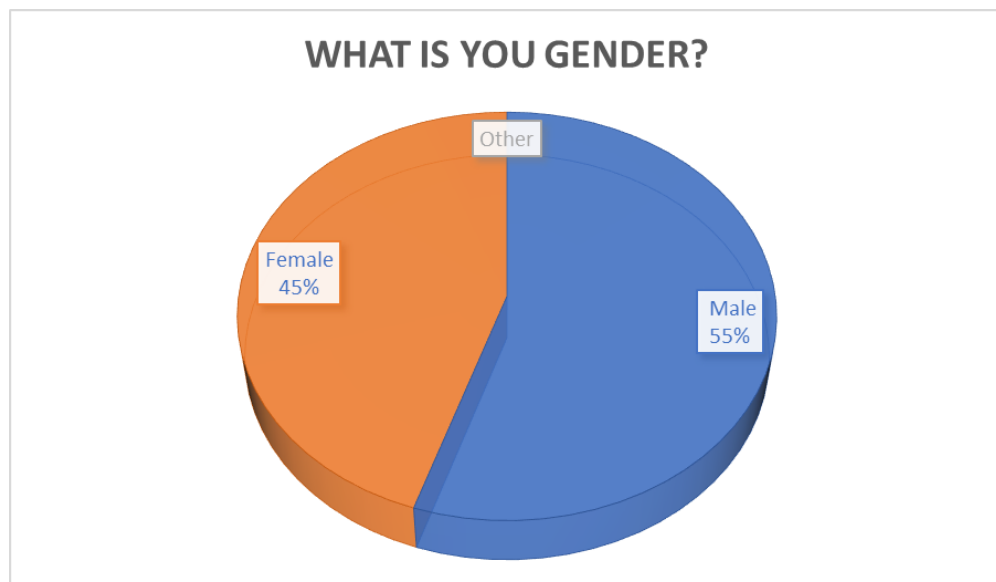


Figure 29 Survey research question

12) What is your age?

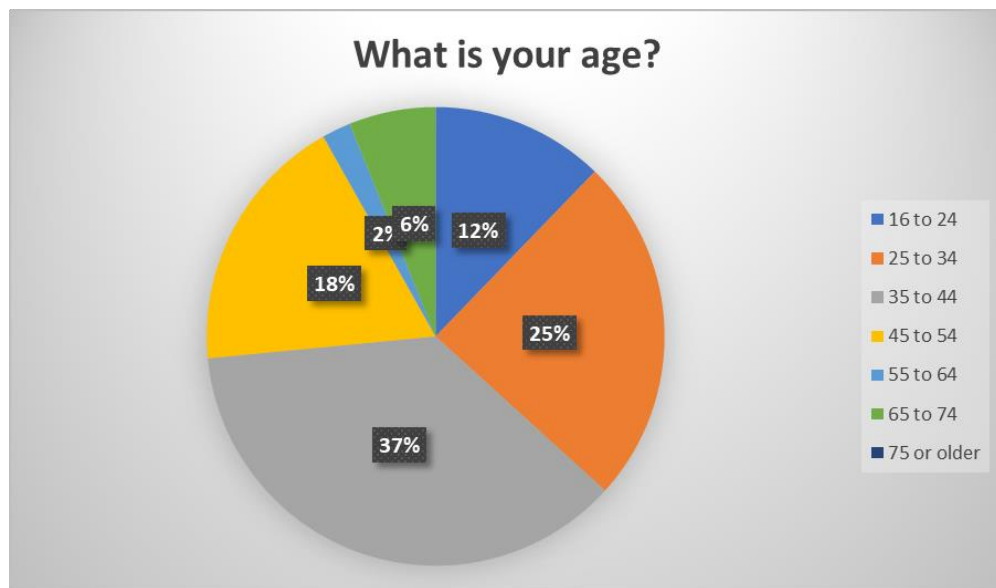


Figure 30 Survey research question

13) Your professional role?



Figure 31 Survey research question



14) Where do you live?

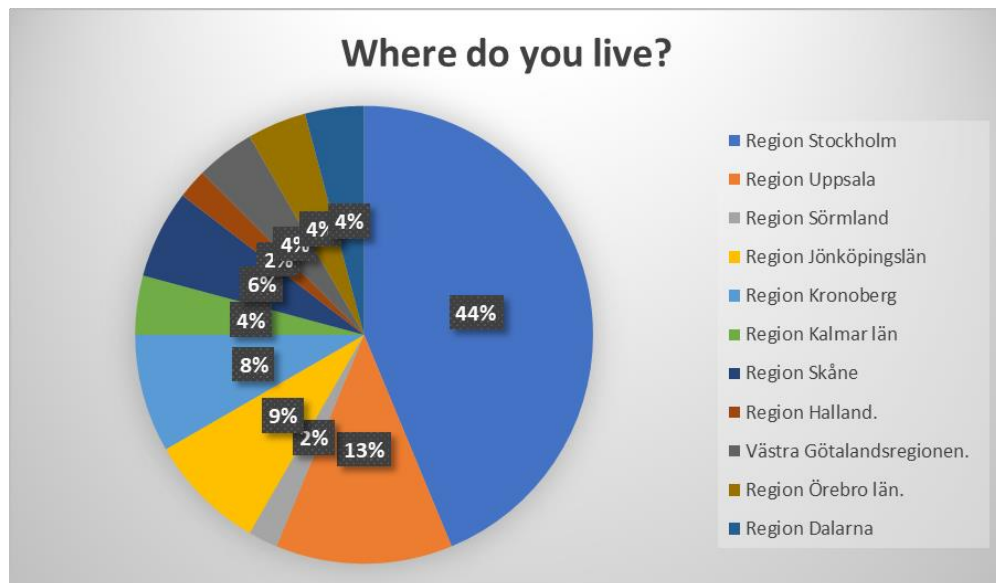


Figure 32. Survey research question



6 Analysis

In this chapter, the results of the project are analysed.

6.1 Analysis of the selected concept

Within the degree project, a product development process was used to develop the concepts for the physical product. When following the process, the authors used relevant and reliable books, and therefore they were able to achieve results. To develop the concepts, the customer needs had to be obtained from the company. With the customer needs the group could generate different concepts, a total of 3 concepts were made using CAD. These concepts could then be evaluated using the elimination matrix, which lead to two out of three concepts being eliminated and concept 3 being the winner (figure 7).

Inside a smart padlock there are components like a chip that handles the electronic part of the padlock, then there are the mechanical parts which handle the locking system and the outer shell that gives the padlock the design, this can be seen on figure 9. The technical feasibility gives a brief overview of the components and materials that goes into developing a smart padlock. This is an important part that lets the company know what materials and components are needed to develop a padlock.

The focus here was to develop an outer design using CAD, that would fit the HirePadlock's desires. Functional requirements and non-functional requirements were created and listed in the report to help the company proceed with a further model of the padlock. These requirements contain important details the padlock needs to have to have it fully working with the whole platform.

6.2 Analysis of the customer survey

A comparison between the results of the survey and the theory review shows that both customer needs and market research play an important role in the product development process for the organization to be able to develop its work in today's market.

Of the 60 respondents who responded to the survey, 57% tend to lend their goods (lessor), while 43% prefer not to do so for various personal reasons (See answers in the survey). The service that most (lessor) mentioned was using Blocket, which shows that the company has managed to get into the customer's attention and that it contributes services that many prefer. The same among people preferred to hand it out in their ads.

There were 57% respondents who answered yes to renting stuff from different places (lessee). Thirty six percent of these lessees selected the service Hygglo, while thirty two percent chose to write their ads on social media.



Most of the respondents who answered question seven considered that having a manual and cheap padlock is a very important functional requirement where they would value different functional requirements for a padlock. A suitable padlock for outdoor came in second place and in third place came having a traceable padlock. Something that can be seen from the survey is that The Hire padlock product is an interesting product that attracts the interest of many customers. A large part of the majority think that they could consider purchasing the product considering other similar products they might use before.

According to the survey, most potential target populations are male between 25-54 age, who mostly have a job and live in large cities such as Stockholm or Uppsala in this case.

6.3 Visualization of the HirePadlock platform

To get a better understanding of how the HirePadlock platform will look like, a model with stick figures was done. This is a more visualized model that explains the company description presented in the introduction.

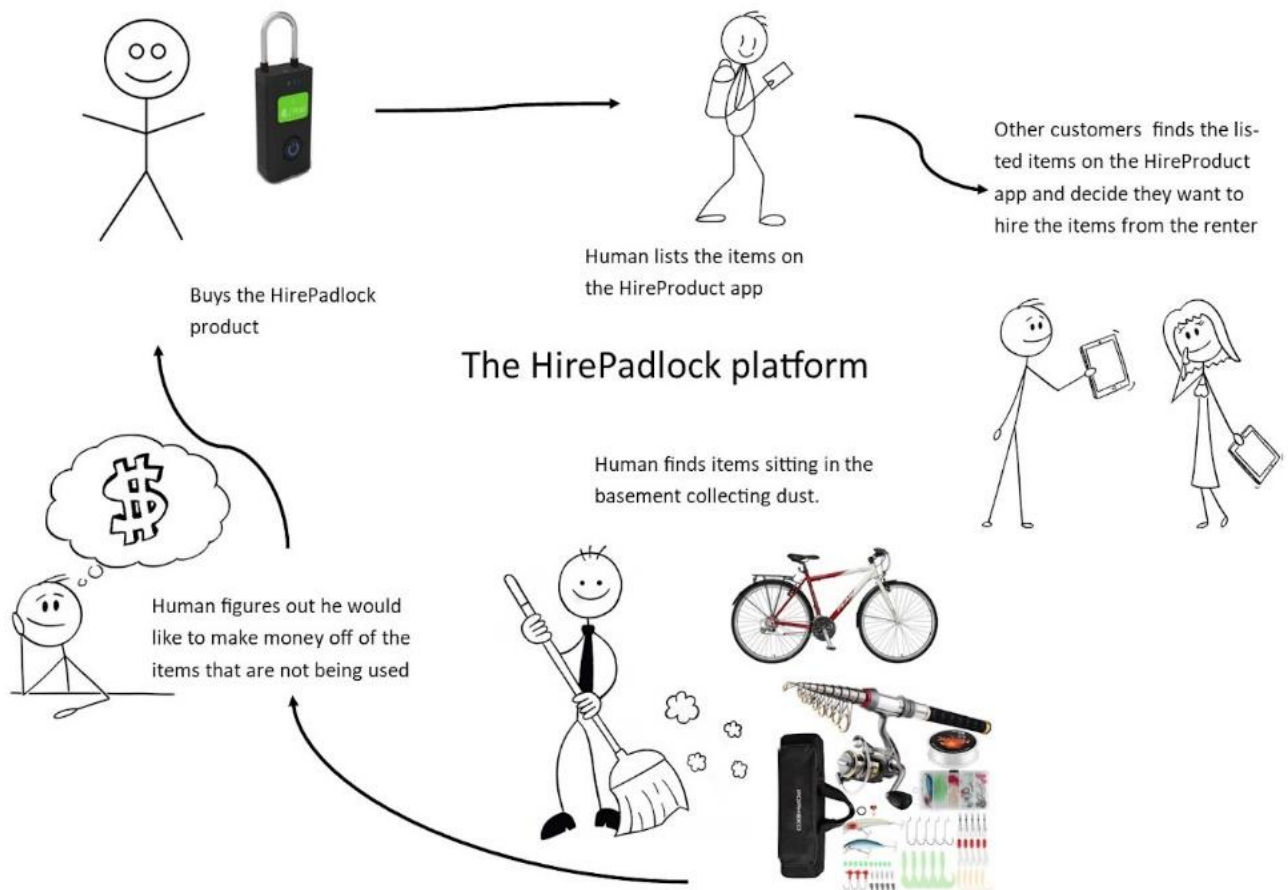


Figure 33. A model explaining the HirePadlock platform



7 Discussion

In the following chapter, our own thoughts are discussed. This includes our own thoughts of the used methods, the results, and the societal relevance.

7.1 Method discussion

As it has been shown in the report, the company uses a standardized product development process that consists of different steps: Identifying the customer needs, the product requirements, concept generation and concept selection. To be able to identify potential customers and understand their perception, thoughts, or point of view on a specific topic, the company uses both The Value proposition Canvas and a survey plan. At the same time, TheHirePadlock tries to define important functional requirements on the product and analyse customer needs by comparing themselves with different market competitors and conducting a survey.

To obtain information about the subject, relevant books were used in the background, such as Product Development and Affärsvärlden, which were written by well-established authors. Therefore, these sources are considered credible. To obtain valid information, the study began by contacting the company in good time, where it was briefly discussed what the report was about and what type of questions were chosen to be asked to the company representative. Therefore, that information is also considered credible. Both the contact person and the supervisor were well acquainted with the product development and the company as well. There was plenty of time during the interviews and many follow-up questions have been asked, which meant that all of them were answered. The survey was initially tested by five test people to increase the study's reliability. This resulted in most participants having good answers with good motivations. The figure below shows an illustration of the methods' connection to the theory section and parts of the product development process.

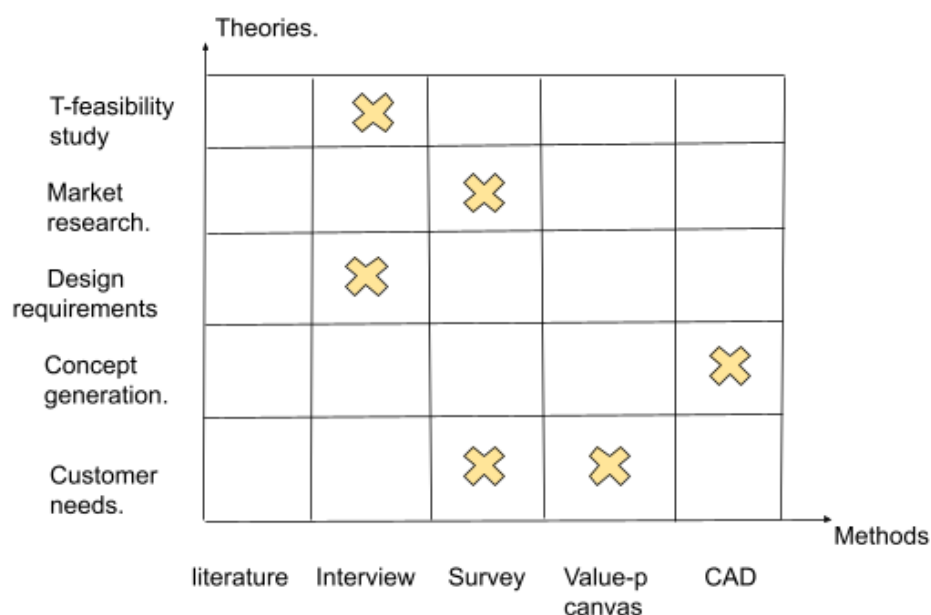




Figure 34. A model of the methods' connection to the product development process.

7.2 Results discussion

Based on this study the goal of the product development process is to develop a product that matches the customer's needs and demand. In this case, if the customer wants to rent out or rent goods without any physical meetings, the customer needs to buy a lock that is certified, tested and classified against a standard or norm. Based on the survey the customer wants a product that has valuable benefits such as: traceable, manual, and cheap, suitable for outdoor use, connects to a network completely without cables, can be controlled with a transponder and smart card and many other services. Methods like survey and value proposition canvas are the methods that companies most commonly use to involve the customer in the process. These two methods are easy to use and provide good information about the customer's thoughts and opinions about the product. These methods can also result in new product ideas for companies, which means that customers are involved in an earlier stage of the product development process.

Overall developing a fully functional product like a smart padlock is not an easy job and requires several things. First, you need to find a supplier for the materials to have an assembled and fully working prototype. Besides having the hardware working there is the software, where the padlock needs to be used together with the app and the smartphone/smartwatch.

7.3 Societal relevance

The process Product development is a complicated process and for a new company to be sustainable is a long-term change work that needs time and order. For sustainability work to function in the business and provide valuable effects, it needs to be both integrated into the overall business strategies and that all employees need to feel involved in running the business.

The results of the meetings that were done with both the company's representative and the supervisor gave a clear picture of how the sustainability process went within the company. The sustainability was created by the employer involving the students and the supervisor in the work at an early stage. By presenting the organisation's goals, fulfilled sub-goals, maintaining communication, and following up the work, the business was able to create smart technical solutions for the product that can attract many stakeholders, i.e., customers.



8 Conclusions

This chapter presents the final conclusions of the project and a suggestion for further research.

For a company to be sustainable and successful in the long-term, it must identify key factors and phrases that are important in the product development process. They need to identify who the customers are, and what key factors are important to the customer. The company must also look at the competitors that are in the market and what they offer for services.

One conclusion that can be drawn from the study is that the included methods provide knowledge about various product development issues and how the work with it can go. The report indicates that meeting the customer's needs during the product development process is something necessary for a new product that is developing to succeed and becoming successful in today's market. By involving the customer, a company can increase its opportunities to compete in the market.

Another conclusion is that it is important that the company can quickly set the functional requirements of the product and its solutions through a faster and more efficient product development process, which in this case was identified through the company's team and the students. These functional requirements must be integrated into the product development so that the whole process becomes easier and together with the team they create more value for the consumer.

8.1 Suggestions for further research

In the process of product development, there are very interesting parts to research. Different requirements for the HirePadlock product were set during the process. Requirements which are important for the company to have the platform working as intended. If the company decides to proceed with their product development, they can use these requirements and implement them to the HirePadlock product. The survey that was conducted in this study gave a rather narrow picture of how the customer identification process went, and if there were more people who participated in it, it would have given a broader picture of how the work is going. However, sufficient information that was needed was found to be able to answer the purpose of the survey.

Another suggestion is to investigate whether the same process applies to other industries than the industry investigated here. Today, almost all products are designed in one or another way, and it may be of interest to look at, for example, an industry where you purchase valuable products.

With the requirements being listed and having a developed concept, it is up to the company to decide if they want to proceed with the concept. If so, the next step for the HirePadlock company would be to find a possible manufacturer, who can



implement these requirements and produce the padlock. An alternative to this would be to find an existing manufacturer who would be interested in doing a collaboration with the HirePadlock company. However, there are still many factors that needs to be considered. Finding a suitable material for the padlock, which makes it durable, but also understanding the components that are needed to produce the padlock. The padlock would need to be able to interact with the smart phone, and the smart phone would be interacting with the HirePadlock app. When it comes to the physical product, the hardware part and the software part are the biggest challenges here.



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