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# Pricing and recurring revenue in hardware start-ups

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Master of Science in Entrepreneurship

Submission date: June 2018

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# Problem statement

The thesis will investigate how hardware-based start-ups seeks to achieve sustainable business models through recurring revenue focus and pricing strategy.



# Preface

This master thesis is written by two students at the NTNU School of Entrepreneurship, at the Department of Industrial Economics and Technology Management (IØT) at the Norwegian University of Science and Technology (NTNU). The thesis is written during the spring of 2018 as a part of the subject TIØ4945 “Innovasjon og Entreprenørskap”. The theme of this paper was motivated by the authors’ own engagement in hardware start-ups. Based on qualitative in-depth research, this thesis has given the authors new and useful knowledge within the field of business model and recurring revenue for hardware start-ups.

The authors want to especially thank the supervisor, Lise Aaboen, for her patience, guidance and support. Her feedback has been most valuable and crucial for the progress of this paper. Also, a big thanks to the interviewees, who have been most kind and shared information that others would deem confidential.



# Abstract

The purpose of this study is to provide time-relevant knowledge to the business development process for future hardware start-ups. This study investigates how hardware start-ups reason their choices when developing their business models, with focus on the revenue model and pricing strategy. The most important underlying factors for their choices and how these choices relate to the product development will be described.

Hardware companies usually sell their products one time to the same customer. Different mechanisms for ensuring recurring revenue exists, but they are often related to software or service. In the literature review, it was found that the underlying rationales and reasoning behind a hardware start-up's choice of price and revenue stream is little discussed. This thesis will contribute to the literature gap by investigating how hardware start-ups develop their business model through collecting empirical data and analyzing it with basis in the literature.

The empirical research was carried out as a qualitative case study, studying three Norwegian business to consumer hardware start-ups and three business to business hardware start-ups. The analysis show that the start-ups have developed their business models though identifying and utilizing their customers as partners for testing the business models. The cases used value-based pricing models, meaning they are creating products only with specifications that are attractive to the users. This enables them to put high prices on their products, as the price is not part of the value proposition.

The results of this thesis implicate that making high-cost products to differentiate themselves is a preferred strategy amongst the cases in the study. Also, it was found that start-ups, already having forms of recurring revenue in their business model, did not consider their business model as recurring. From the cases in this study, it seems as starting off a new company with an innovative attitude towards the business model and that this is important for the success, makes it more likely that the model is developed and changed in the future as well. However, all the cases were focused on finding the customer fast and configure the model to their preferences. This attitude will ensure less time spent on business development and reduce the need for innovation in the business model. The user contact is central to the development for both business model and product.

The authors recommend that future research on this subject should follow up the cases over time, to evaluate their long-term sustainability up against the results in this thesis.

# Sammendrag

Formålet med denne oppgaven er å bidra med erfaring fra relevante eksempler til nye oppstarter som driver med hardware. Denne studien undersøker hvordan oppstartsbedrifter som driver med hardware som sin kjernevirksomhet utvikler forretningsmodellene sine, med fokus på inntektsmodell og prisstrategi. Avhandlingen skal gjøre rede for de viktigste underliggende faktorene for deres valg og hvordan disse valgene henger sammen med produktet de tilbyr.

Selskaper som selger hardware, selger ofte produktene sine en gang til kundene sine, til en fast pris. Ulike mekanismer for å sikre gjentagende inntekt fra kundene eksisterer, men er ofte forbundet med programvare eller service. I litteratursøket ble det funnet at de grunnleggende faktorene bak hardwareoppstarters valg av forretningsmodell og inntjeningsmodell ikke var dekket. Denne avhandlingen vil bidra til å tette dette gapet i litteraturen gjennom å samle inn empiriske data, og analysere det i lys av eksisterende litteratur.

Den empiriske studien er utført som en kvalitativ analyse av seks norske hardwareoppstarter, hvorav tre selger direkte til forbruker, mens de resterende tre selger til andre bedrifter. Analysen viste at oppstartene hadde utviklet forretningsmodellen ved å identifisere og involvere kundene som partnere. Casene i studien praktiserte value-based pricing, som betyr at de fokuserer på spesifikasjonene som kundene setter mest pris på, slik at verdiskapningen for kunden er så høy at en høy pris kan forsvares.

Resultatet av studien viser at eksklusiv prising er en foretrukket måte å differensiere seg på for oppstartene i denne studien. De oppstartene som allerede egentlig hadde mekanismer for gjentagende inntekt, anså dem ikke som gode nok. Ut ifra oppstartene i denne studien ser det ut til at de som starter bedriften med en holdning om at forretningsmodellen skal eksperimenters med, også kommer til å fortsette med denne eksperimenteringen etter at de har funnet en fungerende modell. Dette betyr allikevel ikke at de er raskere til å finne kundene og selge, men de som er raske i denne prosessen slipper å bruke så mye tid på slik eksperimentering. Kontakt med kunden er sentralt for utvikling av modellene og produktet.

Forfatterne av denne avhandlingen anbefaler fremtidige studier å følge opp casene i denne studien over tid for å avgjøre om de er bærekraftige eller ei.

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## Terms and expressions

B2B - Business to business sales. Other businesses are the customers, not the consumers.

B2C - Business to customer sales. Direct, or indirect through retailers.

Business development - The development of the business plan through the lifespan of the star-up.

Business model - Includes information on how the start-up will make money by considering different dimensions. Business model is a simplified business plan.

Business plan - Business plan in this thesis does not necessarily mean a document, but an in-depth plan with strategy that the start-up must become a sustainable business.

ROI - Return on investment. The rate of how much return is expected from an investment as a relative number.

Terms as “the researchers”, “the authors” and “we” or other first person plural references refer to the authors of the thesis, namely Håkon Krogh and Klaus Klausen Espedal.

# 1 Introduction

This master thesis that is written at NTNU during the spring of 2018. This chapter presents the background for the thesis and the problem statement at hand through research questions. Furthermore, the intended way to answer the questions are described, as well as its contribution to contemporary literature, and paper structure.

## 1.1 Importance of topic

Hardware products are traditionally sold to the customer for a price that is paid at the time of the sale, and the customer takes over the ownership of the product for the rest of its lifespan. In the late 80s, the term servitization was introduced by Vandermerwe and Rada (1988), who described a trend in which several manufacturing firms added customer-focused services to their products to increase their competitive advantage. Today, software based business models are well positioned for implementation of servitization, subscriptions and other means of recurring revenue, as the software itself represents a type of service (DiResta et al., 2015).

The emergence of new technologies and perceptions, such as sharing economies and new communication applications, shows that the road to creating and delivering products are continuously improved and changed (Petrovski and Pestana, 2017). A person's behavior is primarily based on stimulus and prior memories and experiences (Mantonakis et al., 2014), and when the production of hardware decrease while software increase, the behavior of the customers towards hardware is likely to change. According to Yang et.al. (2015), the customer's attitude towards subscription-based models positively related to perception of convenience, essentiality, added-value, service quality and estimated usage rate. How hardware start-ups think of their revenue model and how they price their products according to this, is a little investigated theme. It needs to be examined to understand which rationales and considerations hardware start-ups utilize in their choice of business and revenue model, choices that are likely to affect their product. This may help new hardware start-ups increase their chance of succeeding.

### 1.1.1 The entrepreneur and the start-up

The business models in start-up companies are subject for changes and adjustments. To understand how the business model, emerge, it is necessary to understand how the entrepreneurial mindset affects the company, the business model and how they see market opportunities.

Knight portrayed entrepreneurs as risk takers (Knight, 1921). Entrepreneurs should in this thesis be understood as people who are able to creatively discover and exploit market opportunities to create value by starting new companies (Thomas and Mueller, 2000; Bolton and Thompson, 2004; Onouha, 2007). They exhibit their own way of reasoning; effectual reasoning (Sarasvathy, 2001), that focus on affordable loss instead of expected return, strategic partnerships instead of competitive analysis and the leveraging of contingencies instead of exploration of already existing knowledge and prediction. Literature also states that

good entrepreneurs are able to learn from their own as well as other's experiences and transfer those learnings to other domains than the one they were acquired in (Baron and Henry, 2010).

A start-up can be considered as an organization that is temporary and in its first phase of its life cycle, characterized by a high degree of innovation (Blank and Dorf, 2012). A start-up's activity may also be recognized as run in an environment of extreme uncertainty (Ries, 2011). A start-up in this thesis should be understood as a company in an early phase which have discovered an opportunity and is about to introduce a new solution to the market.

### 1.1.3 Hardware start-ups

Hardware start-ups are recognized as a start-up, in which their main activity is focused on developing and selling tangible, physical products. The products may be designed products, where the product is merely physical components with no electronics, for instance tools, toys or furniture. However, hardware products may also include mechanical and electrical components, as well as having a software part to it. In those cases, it can then be called a connected device, or a robotic device if it is automated (DiResta et al., 2015). A connected device refers to a device that has a cellular, WIFI, or other digital connection but is not a cell phone or personal computer. Manufacturing companies are companies that makes original parts, components, or assemble (DiResta et al., 2015).

## 1.2 Background for the thesis

Through a comprehensive literature review by the authors, the theoretical coverage of business models for hardware companies was mapped. Theory on the topics of pricing strategies, and recurring revenue was also part of this review.

### 1.2.1 Literature review and identified gap

The literature review gave the authors insight in the important components and function of business models (Osterwalder et al., 2010; Amit and Zott, 2007), how different models are used by existing companies, as well as an understanding of recurring revenue and pricing strategies (DiResta et al., 2015; Smith, 2016). The review unveiled that the area lack empiric coverage on hardware start-ups, and how their business model is developed in an early phase. More specific the reasoning and thoughts behind their choices. Of the articles available on hardware start-up business models there were three of relevance. DiResta (2015) have developed a roadmap and best practice for hardware startups. They discuss different types of hardware business models, and ways of developing a product. Ries (2011) developed the term Lean Start-up, that describes experimental approach to business development for start-ups. This approach puts the customer in the center and focus on quickly testing the start-up's ideas to validate or discard them. After a while, Ries (2011) suggest the start-up will enter the market with a validated plan. Stock and Seliger (2016) developed a methodology for the integrated development of the product and business model for a hardware start-up. This

methodology describes the sequence of important processes and offers a problem-solving procedure for the development of a hardware start-up.

For a start-up company it is of use to have access to best practices for inspiration, and methodological frameworks to help structure their thoughts, but what's equally important, that's not covered in theory, are the thoughts and reasonings behind the choices that hardware start-ups make. The majority of the literature covers business models that have been utilized, and that exist in current hardware companies. The literature does not contain any empirical studies on how the choice of business model in hardware start-ups influence other aspects of the start-up, such as product development and pricing strategy. A pricing model that takes into consideration the recurring cost of the product and where the true value delivery happens is very important to create a business and revenue model, that will not only allow the company to survive, but potentially also grow over the long-term.

### 1.2.2 Purpose of the study

The purpose of this study is to make it easier for future hardware start-ups in the business development to learn from others' experiences in comparable situations. As outlined in chapter 1.1 the software sector has caused changes in consumers preferences, again influencing the hardware industry. This shift could potentially cause hardware start-ups to become unsustainable due the altered preferences of the consumer. Most literature available on hardware start-up business models are focused on best practices and based on experienced companies. As this shift in consumer preferences is happening now, it is important to supplement the literature with empirical data derived from start-ups for future hardware start-ups to utilize as knowledge. The literature provides guidelines and methodologies, but just as important are the rationales behind these actions and processes. These rationales are not only important as to understand how business model development is conducted, but maybe more importantly why. This thesis will therefore investigate the rationales behind the business model development, with focus on pricing strategy and recurring revenue, in different hardware start-ups as well as look into how these aspects are related to the product itself. The leads to the main question for the study:

“How does hardware start-ups reason their choices in the development of their business model in order to become sustainable?”

By sustainability in a hardware start-up, we mean successfully price their product to cover all expenses, in order to survive, and subsequently grow long-term. This thesis will investigate start-ups that are in the growth phase, to understand their rationales behind their choices in terms of pricing strategy and their attitude towards recurring revenue to become sustainable companies. As the pricing strategy is somehow related to what the companies offer, the relation between the business development and the product development process must also be understood. The empirical data will be analyzed to identify similarities and differences between them to further understand how different hardware entrepreneurs think and act. The goal is to discover concrete rationales that is important in the business development for hardware start-ups.

### 1.3 The research question

To be able to efficiently work towards the goal, the authors have defined one main question and three sub research questions. The main question is a compromised version of the purpose of the study. To be able to answer this, it would be of importance to understand how the start-ups have been developing their business model until now. By going in-depth on this, their methodologies, priorities and attitude towards this development can better be understood. As the pricing strategy is an important part of the business model, as well as becoming sustainable, it will be important to understand which factors are the most crucial for the choice of such model. The authors assume the price will be related to what the start-ups deliver, thus the relation between the choices in their business model and product development will be investigated to understand the whole picture of the choices in their business model. Through the process of answering of the three sub questions, the authors believe the knowledge gained will be enough to form a proper proposition as an answer to the main question.

Focusing on sustainable business model innovation and the impact on hardware start-ups.

Q: How does hardware start-ups reason their choices in the development of their business model to become sustainable?

This is divided into three research questions:

RQ 1: How does hardware start-ups develop their business model?

RQ 2: What are the most important factors for hardware start-ups when pricing their product?

RQ 3: How does their business model development and pricing strategy relate to their product?

### 1.4 Contributions

This thesis describes which rationales and reasons that underlay the choice of business models for hardware start-ups. The contribution will be to make it easier for future hardware entrepreneurs to learn from experiences derived from others in a similar situation, with similar challenges. By studying similar cases, entrepreneurs can gain knowledge (Baron and Henry, 2010). Thus, understanding the underlying factors to both decisions and dynamic behavior in similar cases, will make it easier for future entrepreneurs in hardware start-ups to exploit these experiences. With a best practice from literature, the link to the real world and the situation the entrepreneur may seem diffuse, but as this thesis includes descriptions of the underlying factors behind the decisions should make it easier to relate.

Figure 1 illustrates the current literature's portrait of the relation between the business development and product development. Business development in terms of pricing strategy and revenue model and the link between those and the product specifications will be the main

subject. The literature covers theories on business model and revenue models, however there is a gap between pricing strategy and product development. The existing literature presents business development as an isolated part of a company.

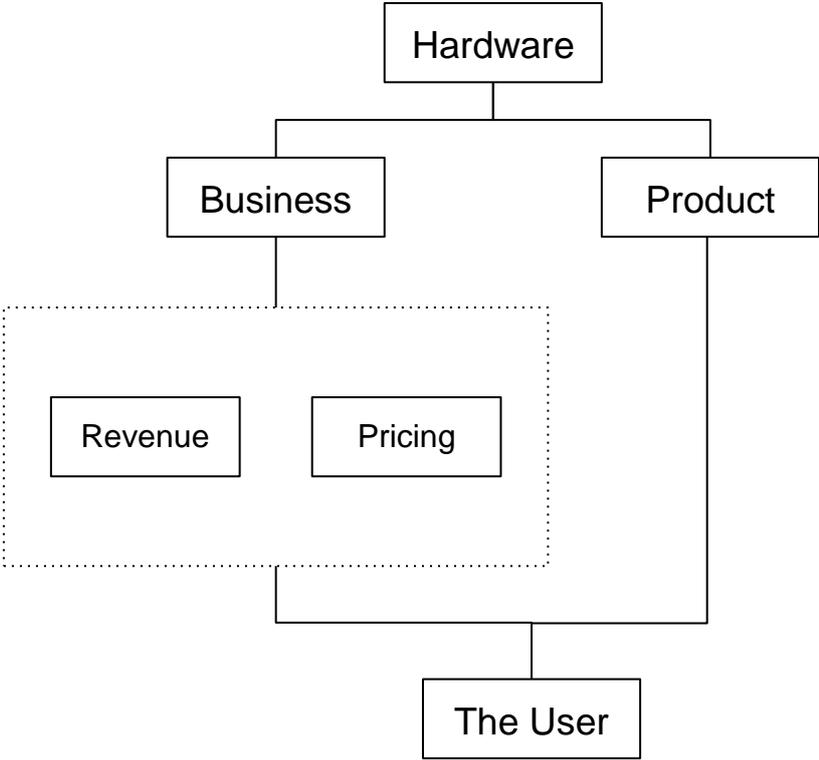


Figure 1: Relationship between Business and Product development

### 1.5 Structure

This thesis will present the following: Theoretical review, methodology, empirical findings, data analysis, discussion, and conclusion with implications for further research. In the introduction, the challenges tied to the purpose and the three research questions have been addressed. A literature review has been performed to form a theoretical basis. The chapter on methodology will explain the process of how the data is acquired and used in relation to the purpose, and then the empirical findings will be presented. Data analysis will analyse the findings with the theory as a basis. Through the analysis it will be assessed if the research questions can be answered. The discussion explores the contribution to contemporary literature, followed by a conclusion if the research has contributed to solving the problem description as well as implications for further research.

## 2 Literature review

This chapter will outline what the theory says about the topic at hand.

### 2.1 Business model

Entrepreneurs tend not to start off with concrete goals, but rather by assessing how their strengths and skills can be exploited to develop the goals (Sarasvathy, 2001). Thus, as the entrepreneur learns more from their experience, the business model must also be subject to change (Trimi and Berbegal-Mirabent, 2012).

A business model is what underlines a successful idea (Rose and Gross, 2016). Rose also points out that an idea can only become a business “if the aggregate economics of the value being created are significantly more than the aggregate economics of the cost of operating the business”. A perfect business model will give the entrepreneur’s new venture a much higher probability to survive as a business, but the perfect business model should also be flexible in order to make changes and adjustments in order to act as “opportunity chaser” (Trimi and Berbegal-Mirabent, 2012), which correlate to the entrepreneur’s ability to learn from experience, described by Baron and Henry (2010). Further Stewart and Zaho (2000) describe the business model as “a statement of how a firm will make money and sustain its profit stream over time”.

The perception on how flexible or permanent the choice of business model could be considered could affect the entrepreneur’s inclination to consider new models for revenue streams. Therefore, we have investigated the view on the agility of the business model in the literature. The business model is a compromised part of the business plan, explaining how the entrepreneur plans to make an idea profitable an into a sustainable business idea (2010). Furthermore, Blank (2010) states that the business model is dynamic and the business plan is static.

Trimi and Berbegal-Mirabent (2012) and Baron and Henry (2010) agree on the entrepreneur’s ability to be flexible, but Baron and Henry focus more on the entrepreneur as a person than the business plan the entrepreneur makes. The mindset seems to be the same: an entrepreneur needs to be flexible, learn from own and other’s experience and adjust the business plan to chase the opportunities as they arise and change. Stewart and Zaho (2000), on the other hand, have a more long-term view on the business plan and he is supported by others as well (Bocken et al., 2014). The difference from Stewart and Zaho and Bocken is that Bocken states that the business plan “incorporate a triple bottom line approach” for the company, but he is not specifically aiming at start-ups. The perception of how permanent the business plan should be considered is split between the different authors in the literature. One of the reasons an entrepreneur needs to be flexible in their business model, is not only to see opportunities; it is also about gaining competitive advantages. One example is cost of manufacturing products. As these costs are dropping, competitors will enter the market, and for a hardware company, this may lead to copies. This is for instance a known phenomenon for western countries, dealing with Chinese manufacturers. If competing for market share alone is the most

important aspect of a hardware business model, every market entry will be about chasing ever-lower margins in order to stay competitive (DiResta et al., 2015).

The business model can create value for the new venture, either by decreasing the costs or enhancing the customers' willingness to pay (Amit and Zott, 2007). No one can fully explain the potential value creation of a new venture (Amit and Zott, 2001), and a good model is flexible (Trimi and Berbegal-Mirabent, 2012) and affected by the experience derived from earlier experience, both personal and vicarious (Baron and Henry, 2010). Chesbrough (2010) even stresses that innovation must occur within the business model as well as the technological part of the business. Bocken et al. (2014) agree that measures can and must be taken to innovate the business model, even though they front the idea that the business plan is the definition of the direction of the company. Thus, the business model of a start-up should be a temporary compass arrow for the start-up and those acting in the environment around it, but also have potential to show how the company plans to make money in the long run.

In 2004, Osterwalder released his work on The Business Model Ontology where he highlighted the most important aspects of a business model. This work led to the presentation of the Business Model Canvas. In a blog post from 2005, Osterwalder presented the nine building blocks of a business model in the all-so-familiar form of the Business Model Canvas. This canvas has later been graphically redesigned, but the content is still the same.

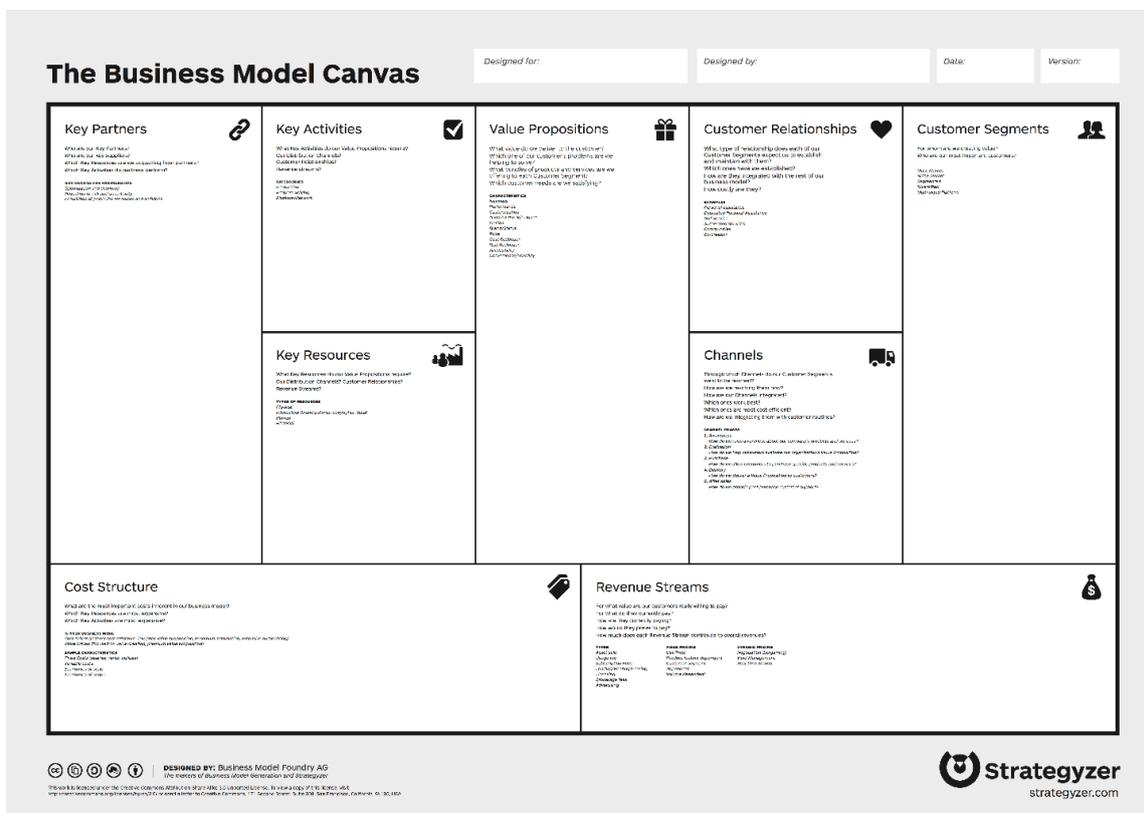


Figure 2: The Business Model Canvas (Osterwalder et al., 2010)

According to Osterwalder, the nine founding building blocks of the business model are key

partners, key activities, key resources, value propositions, customer relationships, channels, customer segments, cost structure and revenue streams (Osterwalder, 2005).

Business models in hardware and software start-ups differ from each other, in the fact that hardware start-ups actually have an advantage with selling a physical product (DiResta et al., 2015). DiResta point out the fact that people expect to pay for physical products, whereas for software it exists a psychological obstacle when it comes to paying for software, apps, or content, because there are so much given for free, or that is open sourced already. However, for hardware start-ups selling more than just a designed product, e.g. including software or connected technology, the pay-for-product model is often not a sustainable way to build a profitable company.

Furthermore, Sjøilen (2012) states that focusing solely on services does not lead to competitive advantage. Services are an important sector of economies, but they are much easier to be copied and reproduced by competitors, which weakens the competitive edge. A physical product is easier to protect with traditional protection mechanisms, such as patent and design protection.

A hardware start-up could identify a model that can provide recurring revenue (DiResta et al., 2015). Recurring revenue will increase the income, thus the aggregate economics of the value being created will increase, corresponding to Rose and Gross' (2016) definition of which ideas can become a business's idea. One way of doing this is to treat the hardware component of their products to enable the sale of software, thus selling hardware enabled software. The caliber and quality of the hardware is important, but the device is merely a piece of the overall product stack. Another way of looking at is that the hardware brings in the revenue, while the software and additional services brings in the margins. If you in addition work simultaneously towards building a brand reputation for high quality with compelling value propositions, the product becomes more protected from competition (DiResta et al., 2015).

The most common ways of business models with recurring revenue used will be described in the following sub chapter.

## 2.2 Recurring revenue

Recurring revenue based business models are becoming more and more regular, especially within software-based services (Aria, 2012). The business model is not only important for the start-up itself, but the start-up's ability to attract early phase angel investors (Livadas, 2012). Recurring revenue will allow the start-up to plan with steady income in the future. Although the concept of recurring revenue is relatively easy to understand, it can be executed in different ways.

In general, most hardware products are sold as a one-time sale. Mechanisms for recurring revenue are often related to something more than just the product itself, which will be shown in this sub chapter. According to Kronlund et.al (2008), a person's behavior is primarily based on stimulus and prior memories and experiences. This behavior will affect how a person

develop habits and preferences. An example of what has become a preferred and accepted revenue model for service providers, is the subscription model. According to Yang et al. (2015) the customer's attitudes towards subscription based models positively related to perception of convenience, essentiality, added-value, service quality and estimated usage rate.

### 2.2.1 Upselling

Upselling is relevant where you are in a position with more than one product to sell. The idea is then to have two or more products that can communicate with each other to enhance the benefit for the customer, or a simpler version of a product to create an entry level product. It can be hard for hardware start-ups, but is a model to consider as a long-term strategy (DiResta et al., 2015).

### 2.3.2 Subscription service

This model revolves around making money on regular fees for the product related services, with a variable upfront cost. This model works best, of course, when it supports products that meet ongoing needs. It is also an excellent way to build long-term customer relationships. The challenge with this model is to determine if the customers are willing to pay continuously to access the product services or not. To succeed with subscription models the user experience needs to be great and provide constant value in order to defend the subscription fee. Extensive price-testing is critical to figuring this out (DiResta et al., 2015).

### 2.2.3 Sunk money

Sunk money means that the customer is locked to one provider of complementary products. The customer buy a platform that is only compatible with additional products that you sell (Kearsley, 2017). One example of this is a coffee machine that only works with specific capsules. Often in these models, the product itself is fairly cheap, but the use of the product is more expensive. Over time, the costs for using the product exceeds an alternative cost, but the switch cost is high, because the acquired product would then be worthless, and a new product must be bought.

### 2.2.4 Accessories

Accessory kits give hardware companies two benefits; the customers get to customize their own user experience based on their needs, in addition to the opportunity to bring in additional revenue through high-margin accessories. However, companies should be aware not to let the accessory production distract them from continuous development of the primary product, as it requires the company to be able to produce the accessories as well. A solution for this can be to partner with other brands (DiResta et al., 2015).

### 2.2.5 Servitization

Through servitization, hardware companies can make their customers feel that their previously purchased devices become new. DiResta et al (2015) introduce servitization as

selling software, content, or services that support or run on a product. In the last decades, business models have increasingly been based on servitization (Cinquini et al., 2013). For example, software as a service, often referred to as SaaS, can be considered as a complete servitization of a non-physical product. This has become an established business model within the software industry, particularly within cloud-computing (Yang et al., 2015), as it allows the companies to dramatically cut their IT costs (Chou and Chou, 2007). Such servitization for a software based company will also enable a business model of recurring revenue whilst gathering vast amount of valuable data from the users (Chou and Chou, 2007).

Servitization is often used by manufacturers to add value to products, as a competitive strategy. It can also be used to supplement the existing products. It is a way to service customers and meet their increasing needs (Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Vandermerwe and Rada, 1988; Petrovski and Pestana, 2017).

According to (Oliva and Kallenberg, 2003) servitization can lead to an expansion of the total market share, in addition to increasing the value of products. Integrating services and products increases the market companies can operate in. It can also be a strong lock-in effect, making the customers more dependent on a company's expertise (Lightfoot et al., 2013).

## 2.3 Pricing strategy

According to (Smith, 2016), the price of a product or service can be based on an arbitrary number, but more often it reflects one or more of the following; market research, competitive dynamics, algorithms, customer negotiations and management discussions. In addition, there are multiple strategies for finding the appropriate level, and it is described as a continuous process in contrast to a one-time job. Rapaccini (2015) suggest that there are factors that can moderate the relationship between servitization, pricing practices and revenue models.

### 2.4.1 Value-based Pricing

Value based pricing is a method of finding an appropriate price level. Using this method, a company will analyze the customers alternative to their product and see how much of an improvement they can offer. The price is then set in relation to how the customer values this improvement. What parameters the customer values the offering by can vary, but common parameters are increased revenue, increased savings and time savings. It can also be based on more soft parameters like better coherence with the customers brand compared to the competitors' product or better comfort for employees. According to (Smith, 2016) this has a positive effect on engineering as well. Companies who utilizes this strategy tends to use the same principle when it comes to adding functionality to the product or service. This means that only features that a customer finds valuable in terms of an increased willingness to pay, will be developed. Doing this correctly can have dramatic effects on a company. As presented by Innovation Norway in Figure 3, one can clearly see the large difference between where companies generally spend resources (solid coloring), and what relative return (hatched coloring) on investment the different categories represents. From left to right the respective categories are business models, networking and alliances, support processes, core activities,

product improvements, solution system, service, distribution channels, branding and user experience. Given that the proportions presented are representative in a company's respective market, implementing value based pricing and value based engineering can yield huge benefits and result in a better business model overall. (Smith, 2016)

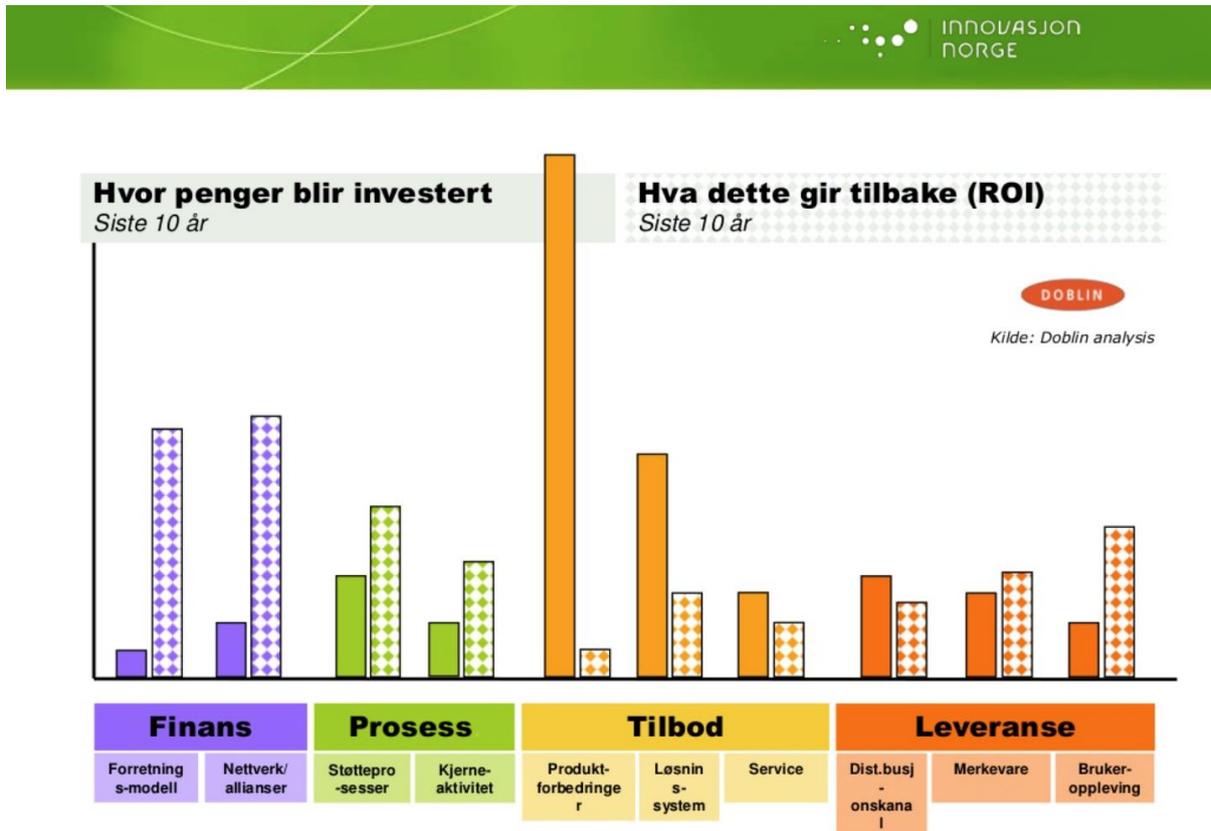


Figure 3 - Comparison of investment and ROI (Mølmen, 2012)

Figure 3 indicates investing in business development (far left) instead of product development (orange far left) is more beneficial in the long run.

## 3 Methodology

The study was performed and written as a qualitative case study. A strong confidence of conclusions drawn from research rely on the research being founded on solid methodological practices (Ketchen Jr et al., 2008). In this chapter we will present the methodological approach we used to answer the research questions.

### 3.1 Epistemology, ontology and methodology

Ontology refers to the individual's interpretations of facts as subjective or objective. The researcher's point of view plays a big role in understanding what could be discovered through the research (Sekaran and Bougie, 2016). A subjective point of view, or subjectivism, has been chosen because business models and experiences are varying from the different actors and because the situation details will play a role in the comprehension of the reality (Remenyi and Williams, 1998). Subjectivism allows the participants to see the social phenomena as a continual process in constant state of revision (Saunders et al., 2009).

The epistemology in this research will be based on and influenced by the interpretation of the interviews, and also the perspectives will be affected and influenced by the interactions with others (Sekaran and Bougie, 2016). Because the field of study is ever so fast changing, the researchers must consider the gained knowledge relative to time. Also, the context, i.e. culture, of which the knowledge is shared must be considered, and not be interpreted as permanent. Saunders (2009) states that axiology, or the consideration of the significance the researcher's personal values and ethics affects the judgments and credibility of the research, affects all stages of the research process.

### 3.2 Research design

According to Eisenhardt (1989) it is easy to become overwhelmed by the amount of data without a research focus. A subjective point of view makes for an appropriate angle for this research as the cases that will be studied will be highly influenced by their surrounding ecosystem and some of the cases may even yet have to actually test their business models. The information from the start-up cases will be collected through interviews. The interviews will form the basis for the analysis.

The aim is to identify how start-ups develop their business models in terms of pricing and recurring revenue. A qualitative approach is chosen as the "how"- question approach from the qualitative research design is suitable to understand the world from the perspectives studied (Pratt, 2009). Using this approach, it will be possible to obtain large amount of information from few companies (Dalland, 2007).

It is in the last block of the Business Model Canvas (Figure 2), the revenue stream, that will be most important. By the end of the day, it is the start-up's cash flow, hereunder their ability to generate revenue, that will decide if they are sustainable or not. The revenue stream will

affect the whole business model. Of course, a business plan could fail because of the value propositions or customer segmentation, but by changing the revenue stream a start-up could manage to generate value. The value stream will also affect the customer relationship, customer segments and cost structure, and changes in this part of the business plan needs to be in line with what that the customers are comfortable with. Also, it may affect the cost structure, for instance if the model includes production and sales of disposable equipment. Thus, the questions for the interviews will be focused on understanding how they have ended up with their current revenue stream and how it works, as well as determining how, if at all, the revenue stream influences the relationship to their customers.

### 3.3 Case Study

According to Bryman (2011) case study is the core framework in the process of collecting and analyzing data. The cases will be described illustrative to convey the thoughts and actions of the start-ups reasoning. These case descriptions will be the basis for the subsequent analysis, which will enable a cross-case comparison.

Eisenhardt (1989) described case study as a research strategy that focuses on understanding the dynamics present within single settings. A case study will rely on several levels of analysis and can involve single or multiple cases studies (Yin, 2014). In this study, six start-up cases representing hardware focused companies will be used for the analysis. According to Eisenhardt (1989) the ideal number of data sets for building a theory on a case study range between 4 and 10 cases. We decided to interview six start-ups as it enabled us to interview an even number of B2C as well as B2B focused companies, in detail. The authors reckoned four would be too little to trust the results, while eight would make the workload too big. In these interviews, both formal and tacit knowledge will be expressed and obtained orally (Dalland, 2007).

#### 3.3.1 Selection of cases

The start-ups had to be relevant in time and culture to be comparable, as we expected the timing to be an important factor of success, reasoned from the nature of entrepreneurs and start-ups. Thus, we were looking for start-ups that had at least had first customer contact, i.e. they had a grasp of the customers willingness to pay. After selecting the start-ups, we dug deeper into these companies to figure out what they had done and what they currently were doing to generate recurring revenue, how they plan to implement it, and their rationale for the decisions. It was anticipated that the start-ups would have based their decisions on both their own and other's experience, in accordance to Baron and Henrys (2010) theory.

The case studies representing the start-ups was chosen on the following criteria:

- Experienced start-ups (2-5 years since founding date)
- Have made first customer contact (made sales, or working with pilot customers)
- Have been seed funded (> 500 000 NOK)

The reason for the chosen lifetime of the start-ups is set to select start-ups that represent a certain degree of relevance in time. Important questions were to investigate how they work with their business model. We conducted interviews with each of the six start-ups, seeking to address the person with most knowledge about the development of the business through the whole existence of the start-up. Because the business development is a sensitive part of the business case, the cases is anonymized.

The start-up cases chosen was mainly selected from the NTNU School of Entrepreneurship's alumni environment and the start-up environments at Digs in Trondheim, StartupLab and Mesh in Oslo.

### 3.3.2 Selected Cases

As seen in Table 2, the six case companies are half and half B2C and B2B focused. They are all Norwegian companies, founded within the last 5 years. None of the companies have more than 8 full-time employees, and they are all hardware start-ups. All the companies have received both public and private funding exceeding the selection limit. Half of the companies have already sold their product, while the other half have not, but are working closely with pilot customers. They are all in the high-end price range of their respective customer segments. Their value propositions are all focused on the product providing high quality, high performance, and better experience. As the market relative price range is highly ambiguous, the price ranges have been divided into three categories:

*Table 1: Price range definition*

	B2C	B2B
Low Cost	< 1 500 NOK	< 10 000 NOK
Medium	1 500 - 3 000 NOK	10 000 NOK - 30 000 NOK
High Cost	> 3 000 NOK	> 30 000 NOK

*Table 2: Overview of the findings*

Case	1	2	3	4	5	6
Origin, year of start-up	Norway, 2016	Norway, 2015	Norway, 2013	Norway, 2016	Norway, 2017	Norway, 2014
Interviewee	CTO	CEO	CEO	CEO	CEO	CEO
Employees	8	13	4	8	3	2
Product description	Designed product	Connected device	Designed product	Connected device	Manufacturing	Connected device
Price	Low Cost	High Cost	Med Cost	High Cost	Med Cost	Low Cost
Price range relative to market	High-end	High-end	High-end	High-end	High-end	High-end

Products sold, business location	10000, Worldwide Mostly in the Nordics	18000, Worldwide	10000, Worldwide Focus on Europe and USA	0, Norway	0, Norway	0, Norway
Business model	B2C Retail	B2C	B2C Retail	B2B	B2B	B2B
Financing	Public & private funding, pre-sales and direct sales	Public & private	Public & private funding, pre-sales and direct sales	Public & private	Public & private	Public & private

### Case 1

The product is a designed product and based on one-time sales. It is a new product category which is a nice-to-have product where the users are young people. The manufacturing is fairly uncomplicated. The product is in the multimedia industry and promise better experience of already existing content as well as higher degree of mobility and compatibility compared to their competitors. They consider their product as a premium with focus on quality and adaptability to every individual user.

### Case 2

The product consists of electronics and software, making it a connected device. The product can be seen as an accessory or enhancer of the customers' existing products from other suppliers within multimedia. Also, mobility and functionality are used as differentiators to competitors. The product belongs in a new product category. It is in the high-end segment and a need-to-have for their early customers. They market themselves towards young, active people, typically people in their twenties. They have focused on direct one-time sales. Production of the product is cost and time consuming, as well as advanced.

### Case 3

The product is a design product, based on one-time sales. Manufacturing of the product is fairly uncomplicated. Their product is considered a medium cost consumer product. However, their value propositions promise the user to give a more authentic experience with their product as well as offering a high-quality, long lasting product. Their main customers are men in their mid-twenties and up.

### Case 4

Their product is software-based; however, they need to develop hardware for the software to have any value. The value prop is in the combination of software and hardware. It enables the users to conduct existing activity in a new and better way. Their product is in the premium price range, even though they have not yet sold a product. Their product is new with a value prop of increased motivation. For some this would be considered nice-to-have, but for their early adopters it would be considered need-to-have.

## Case 5

The case is based on new technology and started off with an idea of enhancing today's solution, with no detailed, technical plan for how to do it. With their product, they offer a new manufacturing method. Their products enable their customers to make their own products more efficient. The price positioning is as a high-quality product, i.e. premium range. The value prop is revolved around products that are more efficient compared to the competitors. Their product would need 2 years more of development for it to be scalable. They are currently working on building a functional prototype based on their customers specification demands.

## Case 6

The company is developing a new hardware technology. It consists of hardware, software, as well as electronic components, and can as such be classified as a connected device. The product helps the customers to enhance the working environments of their employees. Their value prop is reduced strain and better working environment for their customers employees. They have not sold any products yet, as they are developing the technology. As the technology is new and unique, they will price themselves in the high-end segment. They are working with technology verification, as well as market and customer needs.

### 3.3.3 Data collection

The data was collected by using semi-structured interviews. Because we wanted to capture the subjective and objective interpretations of the objects interviewed, the interviews were focusing on different topics, but not controlled or strictly structured, inspired by the idea that questions which are constraining do not create a dialogue (Flick, 2015). In advance of the interviews, the interview objects were sent a presentation of the purpose of the study to prepare, thus making the conversation less constraining and more dialogue like. The interview objects were also informed about anonymity and confidentiality, and the approximately duration of the interviews: one hour. All the interviews were based on the same interview guide. This guide contained more in-detail questions related to the research questions presented in chapter 1. The authors interviewed three companies each, in Trondheim and Oslo respectively and then analyzed the interviews based on the transcriptions. The data will be influenced by the researcher's personal values and perception of the interview (Saunders et al., 2009). Therefore, the interviews were recorded, and transcribed, making it possible for the other authors to validate the degree of personal interpretation of the researcher who conducted the interview.

### 3.3.4 Analysis of data

The methods to sort and organize the data we generated, was done by grouping the information into categories so that it could be compared to related information from different companies. We developed a matrix that accommodates qualitative analysis as well as any quantitative data we find relevant as parameters.

In addition to the formal knowledge, the interviews of the start-ups provided us with what Dalland (2007) refers to as tacit information. In this case tacit information may be experiences from the different business models and how the start-ups worked on and chose the different models. Information like this is best shared in interviews, which is described as the most important way to obtain information for qualitative studies (Mullen et al., 2009). We did a comparison between the start-ups to identify similarities and differences between them. This was both in terms of what they have done and what they plan to do in the future.

Furthermore, the transcripts were used to find more detailed information after the interview, so that the researchers could focus on asking good follow up questions. It was of importance to gain insight into the reasoning behind their choices, as they most likely are influenced or inspired by some external and internal factors that may otherwise be perceived as tacit knowledge. The purpose was to find comparable data from the start-ups that underline the most important steps to take to find a successful revenue stream for hardware start-ups business models.

### 3.5 Reliability, validity and limitations

The reliability of this research was dependent on the start-ups chosen, their experience and the basis for comparison between them. Also, the author's' position as entrepreneurs in hardware-based start-ups can have affected the reliability of the research, as we may have wanted to find an answer that we can implement in our own start-ups so bad that it might affect the critical thinking. We have, however, based our motivation of finding truthful answers to the research questions, as implementing wrongful ones in our own start-ups could do more harm than good.

To enable us to complete the thesis and conclude, we had to be rather strict on the limitations of the scope. This might have led to loss of information that should be included to see the full picture. There might also not be one correct answer on the pricing strategy and recurring revenue configuration that will be applicable for all hardware-based start-ups in any line of business. It may vary from the different areas of business. However, we strived to interview start-ups that are comparable in time and business as much as practically possible, even though we assess the time as more relevant than the business. As all the start-ups interviewed are Norwegian ones, we assessed that the knowledge will be acceptably applicable across the different businesses.

The research was also limited to one interview. Preferably, such research should be conducted over a longer period of time and in so close partnership with the start-up that all the details will be available to understand how they develop their business model, to the point of time to which one can conclude whether they succeeded or not.

Another limitation is the openness of the start-ups. Some might have held back information purposely in fear of revealing too much of their ongoing operations. This was approached with understanding and by trying to create a trustworthy bond between the researchers and the start-ups. The interview objects might also not have had the full picture, knew enough about all the processes in the company or unwilling to give a correct and complete description of

how things are done and why. They may even not have been involved in the process. Also, remembering all steps taken in the past may be hard. Therefore, we prepared the interview objects before interviewing, to give them time to reflect on the past choices and priorities.

## 4 Empirical findings

### 4.1 Introduction

This chapter will explain the most relevant findings found in the research that will later be used as the foundation for the analysis and the discussion. A summary of the findings is presented in table 3. The next sub chapters will then sum up the findings for the individual cases with the goal of presenting the various cases' attitude towards the business model development and implementation process.

Table 3: Case study findings

Case Dimension	1 B2C	2 B2C	3 B2C	4 B2B	5 B2B	6 B2B
Price range rationale	Focus on quality & user adaptability	Create higher expectations from customers	Different price segment than competitors ----- High quality/long lasting product	High-quality Scandinavian design	Developing new unique technology and customized products at low volumes	Developing new unique technology ----- Competitor analysis
Value proposition	Quality, user friendliness, and compatibility ----- Mobility and compatibility	High performance, mobility, and increased functionality ----- Better performance	Authentic experience, high quality, long lasting ----- Higher comfort & functionality	In the software, the experience, excellent design ----- Better user experience	Light weight, Product specs, hardware specs, more efficient, higher-quality ----- Higher product efficiency	The result of using the product ----- Better work environment
Business model Development	Ever changing	Not much of a change since start-up	Experimental/organized chaos	Iterations on business model, but no significant change.	Have considered various business models. Plan to experiment with different models	Have considered two BM, and have landed on one of them for now
Price impact on specs	Price a result of functionality	High performing product impacted high price	Price is a result of the specifications	Product affects price more than the other way around	Price is impacted by product specifications	Technology development will impact price
Interaction with users/customers	Rapid prototyping/ user product testing, social media	User product testing, social media, community building	Product demos, social media, community building	Testing with few users, user-data analysis, surveys, interviews	Direct contact with few potential customers focused on clarifying product specifications	Direct meetings with potential customers understand needs, will start pilot testing soon
Business model & Recurring revenue	No plans of implementation on current products. Planning for future products	No plans of implementation on current products. Offer accessories with high margins. Planning for future products	No recurring revenue, plan to offer accessories.	Strong focus on recurring revenue. Up-front sales + subscription	Focus on RR. Considering licensing model, with royalties. For first market exclusive distribution agreements is more realistic.	Preferred model is licensing, but do not spend too much time on this now. Focus is on tech development

Obstacles for scale	Marketing	Cash flow	Marketing	Funding, team size (need more people), further develop product (hardware)	Cap on number of products they can manufacture. Not yet fully automatic, means working hours, driving cost	Verify technology and market needs
Need to change business model	Plan to change business model in relation to future product lines	Plan to change business model if customers requires it or in relation to future product lines	Plans for minor changes in relation to future products	Believe current business model will suit long-term needs	Their unique technology is in their method not the hardware solely, therefore they need to accustom the BM for this better in the future	Believe current business model will suit needs of current product. May change for future ones
Future	Software, Further business development	Software	Supplementing product series	Product iterations/ development	Experiment with business models and markets	Verify technology and market need

## 4.2 Case studies

Of the interviewed case companies, three are selling B2C and three are selling B2B. Three companies sell pure hardware (designed products), and three sells hardware with accompanying software. Only one of these companies have software as their core value proposition, enabled through their hardware.

In chapter 2.3, accessories were included as a means of recurring revenue. During the interviews, it became clear that the companies themselves do not consider this as a sufficient mean. When talking about recurring revenue, all the interviewees were talking about ways to get regular (for instance monthly) income.

### 4.2.1 Case 1

The idea behind the company was based on own experiences and problems. The team has had a rapid growth over their existence. This case represents a very rapid start-up that has been able to see a market opportunity and quickly mobilize and exploit it within a year. The interviewee (the CTO) has been responsible for the technological development, but also the business development together with the other founder, who is the CEO. He describes himself as a more conservative business planner than his counterpart. Their current focus on business development have resulted in the idea of a new product for their pipeline, that will combine their knowledge derived from their current product with a software or service that will enable them to use a different pricing model.

Development of the product was based on rapid prototypes and testing with a lot of users. Many of the test users were very active, almost as if it was their own project, probably feeling like they were contributing to the development. The price range for case one is higher than

the rest of their markets. From the foundation, it was important to build the product that the entrepreneurs wanted and had visualized. Along the road, they got several inputs on how much the end product would cost, but as the interviewee said: they were totally off in the beginning but started being more realistic as the specifications for the product evolved. The end product was more expensive than what the entrepreneurs, but they put functionality above price.

“The price for our first product was a result of the functionality we wanted. We didn’t want to reduce the quality or functionality from what we considered a minimum.”

Their product is therefore more in the premium level of products in their market. There are several cheaper products, but as the CTO said, those are very low quality and almost one-time use. Their value propositions are therefore not related to pricing at all. Rather, their value propositions are focused around the quality, the user friendliness and the compatibility of their product. They want to build a position as the best product in their category to stand out.

“We tried to reduce the price by 20 % just to check if it was important to the users, but we concluded that it wasn’t. We didn’t sell noticeably more, and in the long run that would have affected the specifications.”

Instead, they introduced a cheaper version of the product, 40 % of the retail price of their first product. The idea for this product was upside-down compared to the first.

“We said: how can we make a product for this price range?”

This product has been stripped for features and specifications, but the most important aspects of the product is still present. Without it actually being a chosen strategy, this version led to a lower entry barrier for new users. After releasing this product, they experienced customers wanting to buy their flagship product after a while because of the more convenient specifications of it.

The development of the business plan has been an ever-changing subject for this start-up. They have tried B2B, B2C and retail and have been exploring these opportunities back and forth several times.

“We haven’t made that one, big, heavy, written document that I think of when I talk about business plan in a long time.”

Their attitude towards the business model has been exploratory and almost playful. They have decided to stay with retail sales as for now, but for the future, they will focus more on direct B2C sales for their existing products for two reasons; staying in touch with the users after the purchase and margins. But he points out that the upside of retail: “If you get the deal, a lot of people will help you sell your product.” He also stated that to change to direct sales, they would need to focus more on marketing. One of their biggest challenges for expanding, is marketing. Because their production is relatively straightforward, they have capacity to scale up, but it should be noted that it would require some changes of manufacturers at different levels. However, they are currently working on deals to enable a possible growth, so their potential production capacity is bigger than their demand. He also pointed out that a challenge

is the long payback time from when they have expenses for production until they get the earnings from the sale, which is another motivation for offering a high-cost product with good margins.

As for recurring revenue, the company has no plans of implementing such strategies to their pricing, although the interviewee admits it would create a preferable revenue stream. As their product in general is affordable, the interviewee stated:

“In my opinion, it would feel more annoying to pay this amount over 12 months rather than just paying it all at once. I also have the opinion that hardware is something you own, while software is something you rent. (...) I could rent a car, and I could consider renting a computer or cell phone, but not something in the price range our product.”

For their next product, they have an idea of how to implement recurring revenue for a service related to the product. It is worth mentioning that this plan is for B2B sales only. This is because they feel that the barrier for a business to rent something or pay for a service is lower than or consumers. However, the generator for recurring revenue would not be the product or service directly related to the physical product, but other services that could be interesting for their B2B customers.

#### 4.2.2 Case 2

In this case, the price was initially derived from the competitors already existing in the market. Because the entrepreneurs in case 2 believed their product would technically outperform the existing competitors, they chose to price themselves slightly above them.

“We did a market survey to see if the users would pay more for the premium functions we would offer compared to the competitors.”

An interesting observation, is that the biggest competitor to this case recently launched a new product, dropping their price to below 50% of the original price. The CEO defends not following this price reduction.

“We don’t believe it would be wise to go head-to-head with them, but we will probably adjust to some degree. They are the market leading actor and are huge. We will never be able to produce as cheap as them and we believe in positioning ourselves as a premium product. (...) Also, being a premium product, people expect more, and this is where we believe that we best can differentiate.”

They have decided not to stay in competition because of them believing in their functionality. The price has been steady ever since the launch almost two years ago.

Their focus has always been direct sales and consumer sales. When the interviewee was asked to explain their development in their business model, he said that they had been very on-point according to their first business plan from 2015. Of course, they missed on how long it would take to develop, but their sales numbers are actually quite in line with their guesstimates from the first plan, only that they in reality are slightly above, and sales are increasing. At an early stage, they stated their focus areas: marketing and product development, and they have been

true to this. If this is because they had followed the plan or done what felt right, and coincidentally followed the plan, the CEO could not say.

“It has never been the plan to do B2B.”

Because the product has been challenging to develop, one of the challenges has been user testing. Because the product consists of several parts, software and mechanics, it has been hard to have a prototype that was ready to test at all levels. But the interviewee states that they should have started the testing earlier anyways because the feedback from the testers has been important, both for the development, but also for establishing engaged people outside the company. And when they did, they should have been more structured in their feedback. Eventually, a lot of the functions and design has been based on feedback from test users.

“Test early with a good framework. There need to be a good structure for implementing feedback in the development process.”

Because of their marketing focus, they have slowly built a community around their product. Having people cheering is good, but even better is it when the community itself does your job for you. The interviewee points out that he has experienced that other people are answering posts on social media about their product and standing up for them. Also, to underline the focus of the importance of service this company had employed three more people to work with customer support the weeks before the interview.

“We experience users answering requests on social media. This is good for us, both because it takes off our load, but more importantly it is more credible than if all information comes from us. This way, the users that argue for us confirm that our product is as good as we say.”

As for recurring revenue, the CEO states that they have no plan for it with their current product. They do offer accessories with quite good margins. He states that even though he’s often told such models will dominate within hardware, he is clear that it would probably be a long time until people would want to rent products in their price range. Their current business model works, and there is no need to change it unless the market requires it. He also points out that for startups, cash flow is a major issue.

“When dealing with recurring revenue, you will not get paid back for your production costs before a year or so after delivering the product to the customer. For direct one-time sales, on the other hand, you get the margins straight.”

Case two have an idea of their next product, focused on a software as a generator for recurring revenue, but this will not be relevant for at least the next five years.

“The bottom line is: cash flow is the reason why hardware is hard and why scaling is difficult.”

### 4.2.3 Case 3

As for case 1 and 2, case 3 classifies themselves as a premium product provider. Their product is above competitors in their market. In fact, the most reasonable alternatives for their

product are about 10% of their price, so they focus heavily on being a high quality, premium product. The price is a result of the specifications. Because of all the existing competitors at lower price levels, they are aiming for a different customer segment, thus being the only manufacturer in their segment.

When asked to explain the development of their business model, the interviewee drew a doodle.

“We have done everything. I would call it organized chaos. We started by making a video of the product and tried to sell it, and we sold 400 units quite fast.”

He describes the current business strategy for this case because of them being experimental in their business plans since the company was founded.

They have tried different sales and marketing channels the whole way and are just about to learn from their previous experimentation. They did not use Kickstarter or similar crowdfunding/pre-sales services. When they started pre-sales, they did it through their own channels. Last year, they did approx. 50-50 B2C and B2B, but this year, the interviewee guessed 60-40 with B2C as their main focus. Further, he describes their product as something that is much easier to sell if the customer has tried the product, but they are now considering different ways of demoing the product than at their retailer's. Because they cannot control the priority they get at every retailer, the knowledge of the individual seller, and the fact that a demo would require quite substantial floor area, they do not feel retail is the best option. They are therefore thinking of new ways to establish test locations for their product.

“We made the product we wanted, and the price came as a result of that. We have done some changes regarding our sub suppliers, but nothing that the user will notice. We want to be a premium product, and it is annoying to see when some retailers market that they have the lowest available price for our product.”

Because the other actors already can offer so low prices, he stated that being a high-quality alternative allowed them to stay at a much higher price range. From all their approximately 10.000 sold products, they have only had one or two defects, which he uses as a proof for this.

Another reason for their focus shifting towards direct sales, is the customer relation. They want to stay closer to their customers and give them service. When asked if they are creating a community, he answered that he would not call it that at this point, but he definitely saw the upsides of it. As for case 2, he pointed out that he experiences customers doing their job in terms of defending them and answering questions on social media. His conclusion was that maintaining a position as a premium product and making a robust product that will survive generations is more valuable than making a product that will break after a couple of years.

“When you buy a premium product, you expect premium service.”

In the product development phase, they tested their product with test users. Ever since the launch, they have been active following questions from their customer on social media. However, the main product has not been that affected by the users. For the next product

series, on the other hand, they will release two new products directly based on feedback through the years.

The company does not have any mechanisms for recurring revenue. They plan on offering accessories and hope to build a community around it to get recurring revenue from some of their customers, however the CEO points out that he does not consider this to be a full worthy recurring revenue model. They are also offering a cheaper version, at same price range as their competitors, to create an entry level product. In difference from many other hardware start-ups, the production is not an obstacle for scaling. Their main challenge is marketing, but he also states that they are doing well compared to how niche their product is.

They are now working on a new series of products that will be released during 2019. The new series will be focused on supplementing products within the area their current product, as well as even more premium versions of their flagship. Ever since the foundation, they have had their main focus on development of their flagship product.

#### 4.2.4 Case 4

The company have yet to take a specific price position as they are not yet commercially available on the market. They are, however, looking to get into a premium segment. Their value prop is revolved around value addition to their customers' existing offering. This increases their customers' user base, but also enhances the value for their existing users. They have been looking at many different customer segments, both B2B and B2C. Over time they have ended up focusing B2B on a specific segment, which allows for easier product and business model iterations.

“We look at a number of different customer segments. Of the B2B segments, we think the segment we currently work with consist of the most commercially oriented, most scalable and homogeneous beachhead segment”.

Since there are very few actors that does the same as them, they have few competitors to compare their price with. Therefore, their price range is a result of interaction with users and pilot customers. Also, analysis of the substitutes that exists and an assumption of what a fair price for the product will be has been taken into consideration. They also think it is hard to set a price on a new product with a new technology.

“Testing the product with end users and pilot customers, as well as a competitor analysis (...) has been the foundation for pricing. There are very few actors who do what we do”.

They also want to use their position as a Scandinavian company in their marketing. As Norway is a high-cost country, the price will be higher than if, for instance, a Chinese company should compete with them. Therefore, they have chosen to position themselves as a premium, high-end product, and focus on Scandinavian design and quality.

“The specifications in the product specify the price. We now see that making the product will cost so much that it must be high end. We live in a high-cost country and we must think a

little high end and do not bother with pushing the price. We have never considered going low cost”.

As stated above, this case, as the previous cases, focus on the quality and specifications of the product rather than the price. Thus, their price is a result of their product’s specifications, not the other way around.

The interaction with their users is both direct and indirect. They have conducted research projects at a university in the past, where interaction have been more direct both qualitative and quantitative. Now the interaction is more qualitative, consisting of observations, talking with users, and looking at user-data. In addition, they still do some surveys. They use these feedback mechanisms actively to improve the product, in terms of user friendliness as well as making the experience itself more interesting user-wise. The customer and the users are not the same individuals, and the users will use the product when physically being at a location owned by the customer.

“Now we just place the product at our customers locations to get people to use it”.

In terms of their business model they focus on recurring revenue. They have already made two sales, but because of complexity in the development of hardware, it is put on hold. However, the customer agreed to a purchase that would be considered as a recurring revenue stream. The deal would secure the case start-up compensation for the hardware, and a monthly stable revenue as long as the product was in use.

“We actually have two potential sales that we have put on ice. The customers agreed to pay upfront cost of hardware with an additional subscription”.

Thus, they have agreed on purchasing the hardware with its sunk-money effect. They reason that it will be more painful to stop the subscription for the customer when they have invested in the hardware, compared to solely software companies. That is one of the reasons why they are pursuing this business model.

” Given that you sell a hardware product, which means that those who buy make an investment it is likely to believe that the churn is lower than for a clean software case”.

After realizing that their hardware takes time to develop, they are now focusing on making the hardware itself as simple as possible. Because the value propositions and differentiators to other competitors are related to the service provided by the software, the hardware itself does not need to compete with the alternatives in the beginning. They are, however, experimenting with the thought of making proprietary hardware, which would make the product more scalable. By doing so they could avoid a lot of the cost related to production.

“We have found that making proprietary hardware can make the product more scalable, as we then would control the entire supply chain, and be able to customize the product to a higher extent”.

To scale they would need lots of funding, hire lots of people, and develop the hardware product to become more robust. In addition, the product as it is now takes a long time to assemble, which is a major cost driver.

“As of now, the product is shockingly unscalable, because it takes a lot of time to put together each product and it costs a lot”.

As for case two, the interviewee reflects that the profitability is better for subscriptions in the long run. However, the payback time is longer. He points out that a margin of 10-20% on one-time sales would result in them the margin up-front, which is good for cash flow. But if they added this profit to their subscription model, they would make 10-20% again and again when the product is down-paid.

“Profitability is so much higher for subscriptions in the long run. If you adjust the up-front price 10-20% then it's 10-20% at one time. But if you do it with subscriptions, it will be over and over again”.

To solve this, they will sell the hardware with little, if any, margins and make the margins in the longer run from subscriptions. It is fair to say that they have a strong focus on recurring revenue and, as for case two, they believe their current business model would suit their long-term needs.

This case has worked quite differently when deciding their business plan than for example case one and three. They have done a comprehensive analysis and landed on one model that they have focused on ever since.

“Choice of business model is about taking care of a variety of dimensions or optimizing for very many dimensions. (...) So we have performed an in-depth analysis for different scenarios for the product and hardware specifically and set columns for all these dimensions and tried to rate it, and our current model scored best”.

They have also thoughts about different business models for their product. He states that renting or leasing could be an option for the hardware. Freeware with ads is an option, but it would probably reduce the feeling of a premium product. In-app purchases, or up-selling, is another option they have chosen not to focus on, but this would probably not be as recurring as a subscription model, which is quite easy to predict.

#### 4.2.5 Case 5

As they have yet to make a sale, they have not set a price on their product. But as they are developing a brand-new technology that outperforms the existing alternatives today, they know it will be towards the high-end segment. This because their product can be easily measured objectively in terms of specs, and they are delivering better specs than their competitors. Their price range was based upon the customers willingness to pay, and as this is an industrial market the pay for performance. As they enable their customers to deliver products that are more lightweight than ever before, in an industry that compete on reducing weight, their price is also approximately 2 times what the existing solution costs. The customers don't care about user friendliness or design, only the technical functions.

“The pricing was set by customers' willingness to pay. (...) there is a willingness to pay \$ 800 - \$ 3000 for our products if we can reduce the current weight with 5-30%. We will therefore

position ourselves as a high-quality product and customize small volumes to optimize the customer's experience”.

The product is suitable in many different segments, and their beachhead has been chosen due to alignment between value prop and product specifications. As for the other cases, the price is a result of the technology, not the other way around. This is also the most deciding factor when it comes to price, namely the product specifications.

“We offer products with lower weight and higher efficiency than competitors. In addition, our production method is extremely flexible, which enables us to more easily (and cheaper) convert production into new products, thus providing specialized customization”.

Because they produce a high-quality product, they also allow themselves to use more expensive materials and methods. Eventually, this will make their product even better. Also, they know their product will sell if they can make a product that is better than the current state-of-the-art, no matter the price. Today’s state-of-the-art products were expensive when they hit the market, but nevertheless, it didn’t seem to bother the customers.

Their customer contact is very close and personal. Due to the nature of their product they have very direct contact, focused around the specifications. Usually the contact is more frequent before they start prototyping, but decrease when the specs are set until testing, because it is of little use to discuss any more details in the prototyping phase unless problems arise.

“Usually, we communicate very much with the customer before we begin with the development of a prototype. (...)I have 2-3 regular contacts that I call about every 2 weeks. This is mainly to get their attention such that when the results are ready, the road to first sale becomes shorter”.

This close contact also makes it easier to measure, objectively, if their product is better than the competitors as their contacts use or are aware of the competitors’ products. Case five started with a conceptual idea with little concrete concepts on how the final product should be. However, the feedback from their customers have been vital to start prototyping and verifying their hypothesis. Therefore, the contacts in the early stage has been important for the course of the start-up. Their product is almost exclusively built with feedback from demanding customers.

“During the first contact with customers the inputs were crucial to concretize what we were supposed to create”.

They have considered different business models and believe that they have many opportunities for change in the future. Ever since the start, their main focus has been B2B, but they have considered B2C for the future as well. As their product will represent a new method, the most plausible models discussed has been sale, rent or royalties. B2C could be an option if they decided to focus on one single area of use.

Recurring revenue is something they have had in the back of their heads all along. However, in the beginning they are competing with big actors, and probably must accept that they

should sell directly without commitments from their customers. Their goal is to enable recurring revenue through licensing and royalties which is their preferred business model but selling the product through one-time sales is more realistic in this phase.

“We are also aware that we are a start-up company and that we compete with established players with relatively good quality stamps. Our first sales will therefore probably have to take place on a one-to-one basis, without further obligations from the customer”.

They also want to experiment with different business models within the different markets to find a niche market with little or none competition.

In terms of their obstacles for scale, the company is only limited by themselves, that is how fast they can develop their product with the desired quality. They are not stopped by the production aspect as case four. However, their product is semi-automatic. It will not be fully automatic within the next years. Therefore, their product is also limited by the fact that there needs to be an operator manually following the whole process which also must be trained. But in sum, development is their biggest obstacle.

“As a hardware company, we are limited by the production equipment we develop, which sets our internal limit on how much volume we can produce”.

#### 4.2.6 Case 6

Very much like case four and five, this case company have also yet to make a definitive price position, but also believe they will be in the high-end segment, due to their technology development.

“We have not decided the price yet, this depends on the technology. We believe it can end up in the same range as one of our competitors. It would be the high-end segment as our technology is new and unique”.

They are focusing on B2B sales, and do not consider B2C. Meaning their product is developed for a specific purpose B2B. The price range is a combination of interaction with customers as well as competitor analysis, but as mentioned they have not made a specific price position. The interaction with their customers have consisted mainly of meetings with pilot customers to understand their needs, and to convey their plans for the product These meetings have given them insight into what the problem actually is for both the customer and user. Getting feedback on the product itself is too early as it is not yet ready. Soon they will start pilot testing with users.

“The meetings with the customer have been to state our vision and identify the customer needs. Through these meetings we have obtained a lot of valuable information on the customers and users problems”.

However, they are not too worried about the price, and are working on technology and market verification, meaning they are looking to verify that the product they are building solves the customers’ problem. Their focus as of now is to build and verify the technology with users, as well as securing funding. In the future, when the product is verified with regards to the

demand in the market, they are looking towards conducting pilot projects to iterate on the solution and improve the product.

“Our main focus is to verify the technology together with our customers and users. In the near future we will start pilot testing with our customers. This will also allow us to get feedback on the technology itself”.

Although their main focus has not been on securing recurring revenue, their preferred model is licensing the technology, which would be recurring.

“For our product we know that there are two possible models, production with one-time sales or licensing the technology, and have considered both. As of now we have landed on licensing, and this is what we are working towards”.

When they have verified their technology, the price will be set thereafter. The price-range they are focusing on now is mainly influenced from their competitors' prices, as well as willingness to pay from their customers.

Like case five, their biggest obstacle in terms of scaling, is to verify both technology and the need, but they also require more people to develop the technology. When they have got that right, they do not see a need to change business model. However, they see opportunities with their current customers for future products. For these products it is very plausible that the business model would need to change.

“We do not see any need to change the current business model, but we might land on different models for future products”.

### 4.3 Summary of findings

Table 4 - Overview business model findings

<b>Business model development</b>	Clear distinction between B2B and B2C in terms of both price, and business model development.
<b>Business model and recurring revenue</b>	The companies think of software or a very costly product would be necessary to build a recurring revenue model. They need some kind of service.
<b>Thoughts on recurring revenue</b>	One challenge with subscription model is that it takes a long time to earn back the hardware cost. Premium products also have higher demands in terms of customer support, which is ongoing cost.
<b>Need to change business model</b>	Start-ups without recurring revenue wants it, those who have it don't think there's a need for change. Case one and three are changing towards marketing focus, which case two already have done for a while.
<b>Ideal business model</b>	B2C companies wanted a different model than what they had today, except for case two, who will stick to their current plan until the market requests otherwise. B2B companies found the ideal business model as the one they were targeting today.
<b>Biggest obstacles for scale</b>	B2C have marketing as the biggest obstacle. B2B have product as biggest obstacle. Product complexity is a factor.

Recurring revenue will allow the start-up to plan with steady income in the future. Although the concept of recurring revenue is relatively easy to understand, it can be executed in different ways. The subscription model is commonly what many think of in terms of recurring revenue, but more broadly it can be any mechanism for recurring revenue that is related to something more than just the product itself.

Sometimes the price of a product is chosen based on an arbitrary number, which some of the start-ups confirmed. However, they all revealed processes containing market research, competitive dynamics, customer negotiations, and management discussions. They also revealed that the pricing strategy was somewhat of an ongoing process, similar to that described by Smith (2016). In fact, all the cases exhibit value-based pricing. The findings suggest that the B2C cases do this to differentiate and, ironically, get a competitive advantage. They want to create products that have specifications that are valuable and appreciated by their users. By making them pay more, they also will expect more, thus their products are already, psychologically, more high-end than their competitors. The B2B cases mainly do this because their technologies are new and may positively affect their customers' ability to gain competitive advantage and value for their customers.

As several of the interviewees pointed out, people expect more service when they buy an expensive product. Interestingly, both case two and three have experienced that their users have become more like a community. Case two has worked actively for this, but case three has not been so aware of this until now. They both experience that people in their communities are taking over the companies' work load of answering requests from others. In this way, some of the job when it comes to service is actually done by the users themselves.

# 5 Analysis

## 5.1 Introduction

In this chapter, the six case companies will be understood and analyzed through the reviewed literature presented in chapter two. First, the analysis will be presented case specific based on the dimensions presented in Table 3, presented in chapter 4.1, before the cases will be compared, where the approach to business model development and pricing strategy will be the main focus.

Throughout the different cases, there were generally more similarities than differences over the studied dimensions. The aspects that are comparable across six individual start-up companies has been represented in table 5, where the general similarities and differences between the cases are listed from the findings. This section will go on to explain these similarities and differences, as well as go into depth, as to how we can understand them, with basis in the reviewed literature.

*Table 5: Overview of the similarities and differences within the findings*

Similarities	Differences
Price range relative to market is high	Business model development in the past
Price range rationale is related to quality and technical specifications	Recurring revenue
Value proposition is related to quality and technical specifications	Need to change business model
Price is impacted by the specifications	
Close interaction with users/customers	

## 5.2 Within case analysis

### 5.2.1 Case 1

Focus on quality and user friendliness is an important factor for their relative high price level. Their main priority is related to develop the technical features that will provide the ultimate user experience, causing their pricing to be a direct result of the specifications, which is recognized in the literature as value-based pricing (Smith, 2016).

This priority is also reflected in their value propositions, where they focus on the user experience. This case has exhibited a very experimental and ever changing attitude towards their business model, and exhibits a high degree of innovation in their business development as suggested by Chesbrough (2010). However, this way of developing the business model may not exhibit flexibility (Trimi and Berbegal-Mirabent, 2012), but rather the lack of a long term goal and confusion as both Stewart and Zaho (2000) and Bocken et al.’s (2014) underline the importance of.

The founders are young and inexperienced; thus, their business model is not based on earlier experience. Being unable or unaware of others' experience from similar products might explain their experimental attitude towards the development. Their ever changing state could therefore be the result of not being able to acquire vicarious experience, as Baron and Henry (2010) state is essential for a good entrepreneur. On the other hand, one can argue that their experimental approach will give them first-hand experience for the future.

Customer interaction is important for this case, to enable them to verify their specifications are satisfying, and in the beginning they tested with users. Because value-based pricing yields that only features the customer finds valuable in terms of an increased willingness to pay, will be developed (Smith, 2016), the contact is important to find out if this is true. However, for this case, this contact is first initiated after the sales has occurred, meaning they will only get feedback from those who already bought it. Even though they are selling, marketing is one of the biggest obstacles for scaling. This indicates that they are struggling to develop the features that their users truly value. Additionally, they do not communicate with their new customers, leaving their first customers the only reference for their features and price.

They see implementation of software or service as their only viable option for engaging a business model with recurring revenue. This case has concrete plans for such a model with service as a part of the subscription-based product. Specifically, they are aiming for B2B with these attributes. This is because these features alone will not be convenient, essential or value-adding enough for the B2C market (Yang et al., 2015).

### 5.2.2 Case 2

The most important factor for their relative high price level is their desire to be perceived as a high-end product and make the users expect more from them. Naturally, this affects their value propositions, where they focus on technical specifications and functionality. This case is also in line with the value-based pricing (Smith, 2016).

This case has not been changing their business model significantly over time, and the immediate impression is that they don't prioritize to do innovation in their business model equally as for their technology as recommended by Chesbrough (2010). Even though business model innovation has a lower priority for this company, it has not prevented them from reaching a market position with continuous growth. The model has been revolved around the long term goals (Stewart and Zhao, 2000) and has actually been more or less the triple bottom line approach (Bocken et al., 2014).

The founders themselves are in their late 20's/early 30's, but the business model is not based on earlier personal experience from business development. Their ability to develop one business model and follow it through indicates that they have been observing other similar companies, thus acquiring vicarious experience (Baron and Henry, 2010).

Customer interaction is important for this case, but they have been hindered by technical difficulties to test early enough. Even though they have been testing with users, the results have not been good enough because of the structure of the testing. When focusing on being a premium product, the features that a customer finds valuable are promoted and used as

differentiator to increase the willingness to pay (Smith, 2016). They have succeeded in this to some degree, as they are selling and sales are increasing, thus their differentiation is appreciated and valued enough by their customers for them to want the product (Yang et al., 2015).

The user interaction has been direct and related to those who already bought the product, and they have succeeded in creating a community of users. But even if some of the customers are acting as ambassadors for the company, they must have a substantial reach to make a real impact on the company's cash flow, which is their biggest obstacles for scaling. This indicates that they are not likely to incorporate recurring revenue in the future for this product, because of the longer payback time than for one-time sales. They are prioritizing to sell directly, which enables them to get in contact with and get feedback from new and old customers.

They see implementation of software as their only viable option for engaging a business model with recurring revenue. This case has future ideas for a product where a model like this could work. However, they do not stress it. Even the development of the revenue stream is based on the customers' preferences and convenience, and they will only change it if it is a demand from their customers. Thus underlines Yang et al.'s (2015) thoughts on pricing, and also goes to show that they are open to innovation and flexibility in their business model (Trimi and Berbegal-Mirabent, 2012; Chesbrough, 2010).

### 5.2.3 Case 3

Creating a long lasting, quality product is the main differentiators for this case in terms of defending their high price level. Thus, the pricing reflects the specifications in the product, and this case also represents value-based pricing (Smith, 2016).

Value propositions are affected by this, and their main value propositions are linked to the specifications that drives the price up. High quality and comfort are the most valued propositions. This case has been experimental in their business development. They have been flexible (Trimi and Berbegal-Mirabent, 2012) and adjusted to the user's preferences. Also, they are still innovative in terms of finding new ways to reach and interact with new users and customers. Clear long-term goals are not as visual for this case. However, they do have plans for the future, yet flexible, both supporting Stewart and Zaho's (2000) and Trimi and Berbegal-Mirabent's theories (2012).

The founders have been working with this case for more than five years and have been gaining experience through that period. They are in their 30s, and this is their first start-up, however, their business model has been changing a lot over the times. It seems like they have mostly been learning from own experience, and not so much through vicarious experience. This does not necessarily mean that they are not gaining the knowledge well enough, as Baron and Henry (2010) states good entrepreneurs is able to learn from both own and other's experience.

Customer interaction is very important for this case to be able to sell. Because they have a product that is hard to understand without testing it, they need to make sure people understand why they are better than their alternatives. Thus, they are struggling to communicate that their

pricing is a result from the specifications that the users value (Smith, 2016) before people have actually tested themselves. They are now prioritizing to sell directly, to get closer to their users, even though they are doing retail. Their idea of establishing test locations will allow them to get in contact with and get feedback from new customers.

They do not see any other option than accessories and upselling as viable for engaging with recurring revenue. This case has concrete plans for such a model and have already released an entry product. with service as a part of the subscription-based product.

#### 5.2.4 Case 4

This case is developing a hardware enabled software. They utilize Scandinavian design to optimize user experience to reason their high price. Their pricing is a result of a comprehensive analysis, consisting of amongst others the customers willingness to pay. The customers willingness to pay is impacted by the specifications. As they are working with pilot customers and have already gotten a purchase proposal from two of them, they have proven that these features are valued by their customers, thus this is also an example of value-based pricing (Smith, 2016).

High quality is also a part their value proposition. Actually, their value proposition is to enable higher motivation from the users to utilize their customers offering. Better user experience, more fun and a professional design makes sure the users will appreciate this case's customers above their competitors. The customers are willing to pay for these features, so they are the focus in the development. Thus, making a good business model, exhibiting flexibility (Trimi and Berbegal-Mirabent, 2012).

The CEO has experience from a previous start-up doing B2C consumer products and is in his mid-30s. As one of the youngest cases in this study, they have exhibited a fast business development process with a clear direction (Bocken et al., 2014) and a long term goal (Stewart and Zhao, 2000) of developing and iterating on the same product. This fast time to market leads to believe that they can combine both own experience from previous start-up and the ability to learn from other's experience from similar cases. This, according to Baron and Henry (2010), is the proof of good business development.

Customer and user interaction has been important for this case. They have gathered data from test users and done interviews. They have formed a good understanding of the user base and created something they want. Selling it to their current customer to improve their offer was chosen as a faster way to market compared to selling directly to the users. Their business model creates a sunk money situation where the customers acquire the product and then subscribe (Kearsley, 2017), thus ensuring long time revenue. However, the software is the enabler for the subscription model. Without it, they would be likely end up with a one-time sale model with a hardware only product.

#### 5.2.5 Case 5

This case is developing a new technology; thus, their pricing will be dependent on how well the technology works. They operate in a business with a substantial willingness to pay for

lighter solutions, and this is what they focus on and will determine their price range. Thus, their focus for development and the price are directly linked to which features their customers find the most valuable, corresponding to Smith's (2016) theory on value-based pricing.

Focusing on the customer's need, their value propositions are also linked to what's important for the customer. High quality and low weight is essential in their market and is also relatively easy to benchmark towards competitors. Their business development does not seem to have been the main focus, as they prioritize to develop in partnership with their potential customers. At this point, their current business model is temporary and lack the long term perspective that Stewart and Zahra (2000) underline the importance of. However, they do plan on testing different models after the first sale, so they exhibit an understanding that they need to change and chase opportunities for their business model, which is important for a new venture to survive (Trimi and Berbegal-Mirabent, 2012).

The founders are in their mid-20's and in their first venture. Their business model has been subject for discussion, even though they have been quite clear on what they wanted from the start. Starting off with just an idea, but no clue on how to execute it, indicates both willingness to take risk (Knight, 1921) and creatively discover opportunities and exploit those (Thomas and Mueller, 2000), which are qualities that are often seen in entrepreneurs.

Customer interaction is important for this case and has been close and direct. Their contacts are future potential customers and must be seen as strategic partners. Another quality deemed highly regarded for entrepreneurs (Sarasvathy, 2001). They use this contact to develop the features that the potential customers cares about, thus making sure they are in line with the principles of value-based pricing (Smith, 2016). As they focus on few customers in the beginning to act as reference customers, they are able to use a lot of resources to follow up few contacts.

They have different ideas on how to make recurring revenue a part of their business model without changing the product or adding any service to it. They can do this because their technology is fairly expensive and exclusive. One model is licensing and gaining royalties as recurring revenue. However, their market is dominated by large, established companies as competitors, thus they need a reference customer to prove that they can deliver.

### 5.2.6 Case 6

This case is also developing a new technology, and the price will be decided as a result of the technology. They have actively been conducting interviews and meetings with potential customers from the start. They are forming strategic partners, which Sarasvathy (2001) underline the importance of. Customer interaction is therefore direct and close. They use this contact to develop their technology in line with the most valued features from the customers, leaning on the principles of value-based pricing (Smith, 2016).

Their value propositions are directly related to the performance of the technology, where they focus on the user experience. Their business development has not been in focus, but rather focusing on development of the technology in partnership with their potential customers. Their business model is chosen out of two options, and works as a statement of how this firm

will make money and sustain its profit stream over time, as Stewart and Zaho (2000) underline the importance of. They believe the model will work in a long-time perspective. Impression is that they don't prioritize to do innovation in their business model equally as for their technology as recommended by Chesbrough (2010). In fact, they focus fully on the development of the technology until it is ready for testing. Interestingly, they disregard the need to change and innovate their business model in the future for this product. According to Trimi and Berbegal-Mirabent (2012), this is important for a new venture to survive.

The founders are in their late 20's and this is their first venture. Their business model has been subject for discussion, even though they have been quite clear on what they wanted from the start. The lack of focus on the business model indicates that they either have little interest of doing so, or that they have successfully found and added others' experience to their model, the last of which Baron and Henry (2010) sees as important qualities for entrepreneurs. However, it seems like by using strategic partners, they have successfully developed their business in a direction that will be successful. This quality proves that they have entrepreneurial qualities (Sarasvathy, 2001) and leads to believe they actually have found a model that will work and that they therefore chose to prioritize otherwise.

They have not considered other ideas to recurring revenue except for licensing, that will save them the cost of producing themselves. They believe their model will work on a long-time basis, and do not feel the need for adjustments except for new products.

### 5.3 Cross-case Analysis

This section will analyze the cases in comparison to each other. The outcome of this chapter is to be able to answer the research questions presented in chapter one. Because the in-case analysis revealed equalities in terms of customer contact and product specifications, this section will start with analyzing these dimensions.

#### 5.3.1 User interaction is important for product specifications

One common denominator for all cases was their user interaction. All the cases have very direct interaction with their users and customers. The B2C companies, have most of their interaction with customers after the sale has been made, in terms of feedback, while most the interaction before is with lead-users. This means they get their future product feedback from customers that will not necessarily buy the latest product, as they already own one. Case four to six are all focusing on connecting to a limited number of close customers, or strategic partners. This, Sarasvathy (2001) describes as an important quality for entrepreneurs. For the B2C cases, the users who are involved in the product development from an early stage probably feel more connected to the product and as a contributor to the final result and can also be recognized as key partners.

All the cases use the customer contact actively in two of their building blocks in the business model canvas: in the block of customer relation and as key partners. Close contact with users to test the products is recognized as a key activity for all the cases. For some of the B2C cases, the customers even acted as a resource in this matter. Not surprisingly, this indicates

that listening to the users/customers is a priority in order to differentiate and create the ultimate product for them, thus increasing the customer’s willingness to pay. However, the price aspect was not a priority at all, as it with this focus, cannot be one of their value propositions, at least not as a start-up. This will affect the value stream. The link between the blocks representing customer contact and strategic partners are value proposition, key resources and key activity (Osterwalder, 2004). It is clear that start-ups are low on resources from the beginning, and as theory has shown; entrepreneurs focus on opportunities.

Figure 4 illustrates the overall similarities between the cases in the business model canvas at the time of the interview, derived from their customer contact. This is to illustrate the similarities between both the B2B and the B2C cases.

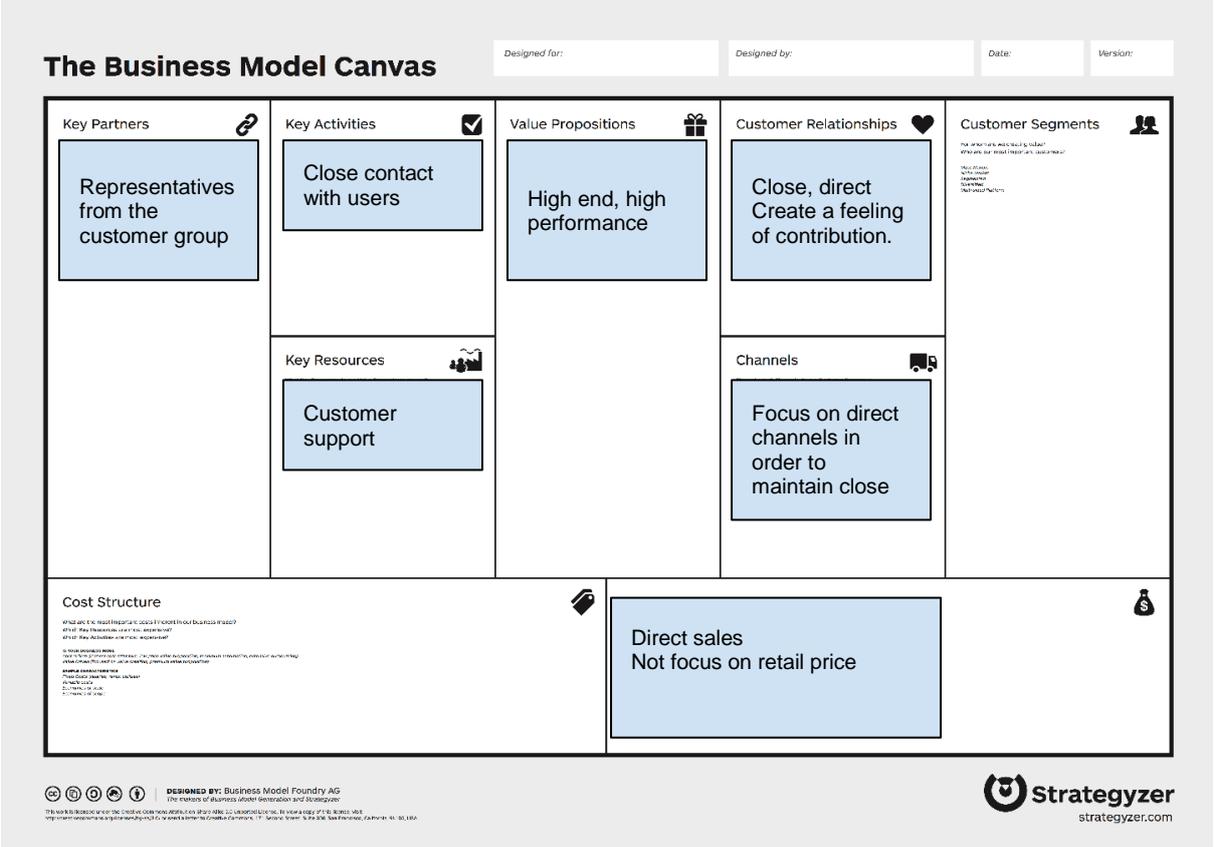


Figure 4 - Similarities in the Business Model Canvas

Even though Figure 4 illustrates the similarities, there are very different approaches to this contact, as explained initially in this section. Figure 5 illustrates the feedback loop for B2C and B2B cases respectively. B2B companies are focusing on few, strategic key partners. These key partners are likely to be customers, and the contact is initiated early in the development process. Testing and developing together with them is a strategic choice to ensure a future sale. B2C companies focus their contact on customer support, meaning the product is already sold when the contact is initiated. Their test users are in fact their customers, except for in the early stages, where they test with test users. Thus, the iteration process for developing the product will not happen before after selling it. It is therefore worth noticing that B2C companies’ biggest challenge for scaling is actually reaching the users

through marketing, thus selling it, as their eager users are important for their feedback loop. In fact, B2C cases were looking for more resources within these areas. Also, keeping contact with all the users is resource demanding. Thus, an advantage for the B2B companies, having few and close contacts, is that keeping close contact with fewer customers demand less resources. It also enables them to get feedback on what they should make before they start the development, while the B2C cases in general get most of their feedback after the development is done.

### The Feedback Loops

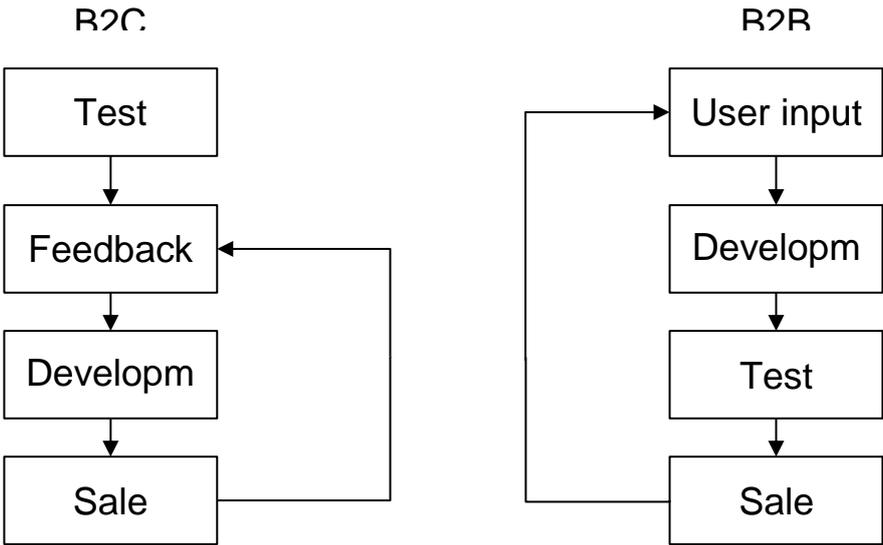


Figure 5 - The Feedback Loops

The B2C companies also reported that their products are creating communities for the customers. A community around the company can lead to customers defending the company and the product, as well as recommending it. These behaviors are both time and cost saving and can be considered free marketing. These users probably feel like they are a part of something bigger, that they only can get from acquiring those specific products.

#### 5.3.2 Price is directly related to product specifications

The case studies indicate that the value proposition is of high importance for the product development for start-ups. All the cases expressed that their specs and value propositions where more important than focusing on price and none of them are competing on price. As the literature suggests, none of the cases are competing for market share alone, but for users with high demands for their product. If competing for market share alone is the most important aspect of a hardware business model, every market entry will be about chasing ever-lower margins in order to stay competitive (DiResta et al., 2015).

In terms of the price ranges they are targeting, they were all aiming at the high-end segment of their respective markets. This finding supports the theory presented in chapter 2.2, that the business model can create value by enhancing the customer's willingness to pay (Amit and Zott, 2007). All of the cases could, potentially, be competing on price, however they are enhancing the customers' willingness to pay. The reason, referred to as the price rationale in Table 3, is found in their value propositions, which were all somewhat revolved around high quality, high performance, better experience. This indicates that they are looking to enter the market as high value products, differentiating themselves on better specifications. These specs were derived as values from their customer interaction, thus all the cases have been recognized as companies executing value-based pricing strategies (Smith, 2016). Another reason could be that competing on price would require selling big quantum. This would affect their marketing and cash flow, as the margins would be lower. Also, established actors could be able to manufacture cheaper, thus outperforming the start-ups if the price was the most important value proposition.

Case five is a good example of the approach of using their customers' preferences in the value-based pricing process. They have strategically identified the customers alternative to their product, analyzed the aspects that the customers would value the most and set their price in relation to how well their product performs with regards to these aspects.

### 5.3.3 Business model development is related to the initial attitude

Through looking at how the cases have developed their business model in the past, and how they perceive the need to change it in the future, it could look like the ones that have done many changes in the past, also feel the most need to change in the future. Case one and three have done a lot of changes and still feel the need to change.

Case one has been the most experimental, and it seems like they have not had a long-term plan for their product from the start. They wanted to get the product to the market, but they did not have any clear idea on how, so they tested every opportunity they came across. Case three referred to their development as organized chaos, however, they have been less experimental than case one. Both these cases have sold directly to consumers and through retail. In addition, case one has even sold B2B.

Case two started with the goal of selling directly B2C. They feel this is right business model also in the future unless their customers change their preferences for revenue model. Case four is similar, however they have thought about doing B2C, but not actually done it. They have thought about different revenue models, but their current one is the preferred. This could be the reason why they don't see the need for change, as this model is optimal for them at this time. Case six have considered two different models and are currently sticking to the one they assume can accommodate their long-term needs. Case five, however, have experimented with other models, but have found their preferred model for their first sale. However, they do feel the need to change in the future when their technology is verified by a reference customer.

The study showed that the different companies have a very different approaches to the business model development. Some of the cases illustrates Sarasvathy's (2001) portrait of

entrepreneurs as people who starts without a concrete plan and chase opportunities (Trimi and Berbegal-Mirabent, 2012). Case four is a good example of this as they started out with a method they wanted to enhance without any concrete plan on how to do it or how their product would look like. The two other B2B cases had more of a concrete problem they wanted to solve. However, the B2C cases exhibits the quite opposite. Case one, two and three were clear on what they wanted to do from the beginning product wise, however they have not been certain on how to do it. This indicates the opposite of Sarasvathy (2001), who states entrepreneurs start without goals. It seems like having a clear goal of what to make does not indicate that the business model will not evolve, and still makes room for business model innovation. It is interesting to see that even if the start-up is clear on what they want to create, no indications are found that this means they are more determined in their choice of business model than those starting with more abstract ideas or concepts. This could be an indication that business model and pricing is dependent on the external circumstances.

The cases with most flexibility and least long-term attitude towards their business model are case one and three. Case four has been iterating on their business model, exhibiting a limited degree of flexibility in this matter. Case five and six have considered several models. Case two stated clearly that they were acting quite similar to what they stated in their business plan from 2015, even though this might very well be coincidental. They have indeed used their model as “a statement of how a firm will make money and sustain its profit stream over time” (Stewart and Zhao, 2000), and set the course with their first plan, thus being the least innovative case in terms of their business model which Chesbrough (2010) argue to be equally important as technical innovation. However, flexibility must not be confused with innovation, as they have developed and adapted their plan to a model that works. The companies that have been working closest with their customers are also more inclined to adapt their business model towards their customers without experimenting. In fact, the findings provide little proof that support Chesbrough (2010) in the business model innovation being vitally important, however the idea of testing the models finds support in the findings.

All of the cases have been considering several different models and ideas of how to create a revenue stream, and they all show tendencies of flexibility in their models, as Trimi and Berbegal-Mirabent (2012) suggests an entrepreneur should. All of them seems to agree that it is important to adapt the business model to their respective markets in some extent. Except for case one and three, all the others use the model as a long term strategy, supporting Stewart and Zaho (2000) and Bocken et al. (2014) who portrayed this as important features of a business model. The choice of business model is not so much based on experience from previous start-ups, as all except one of the cases is the first start-up for the entrepreneurs. However, the similarities between the cases are striking, leading to believe that they have derived vicarious experience from other example in their markets, which is a valued quality of an entrepreneur (Baron and Henry, 2010):

Table 6: Common factors for the B2C and the B2B start-ups

	B2C	B2B
Common for all	<ul style="list-style-type: none"> <li>• Have done pre-sales for funding / market research.</li> <li>• Are selling directly</li> <li>• Want close contact with customers</li> <li>• Are focusing on marketing</li> <li>• Do not feel recurring revenue is possible</li> <li>• Differentiating on specifications</li> <li>• Down prioritizing retail sales</li> </ul>	<ul style="list-style-type: none"> <li>• Close cooperation with some few customers</li> <li>• Developing high-tech solutions</li> <li>• Concrete plans for recurring revenue</li> </ul>

The feeling that they need to change their business model can be related to the initial attitude towards it. Some of the cases found a working model in the beginning, and some did not. The ones who did find a working model in an early phase, have focused on product development and customer contact. This implies that the degree of business model innovation does not reflect the relative success of the company.

#### 5.3.4 Recurring revenue is enabled by software and service

Implementation of recurring revenue is different between companies doing B2C and companies doing B2B in this study. Interestingly, the cases excluded sales of accessories and upselling as full worthy models for recurring revenue. In general, the B2C cases are not prioritizing this, but the B2B cases were more inclined to focus on recurring revenue. Two of the B2B cases were actively looking for ways to implement it into their business cases, whilst the one with apparently most technology development remaining (case six) were not. Interestingly, case five were also focusing on direct sales, but only to establish themselves in the market before engaging recurring revenue in their model long term.

The only company focusing on a subscription model was case four. Even though several of the cases represent a connected device, case four is the only case that actually have software as the foundation of their value propositions. The hardware is rather an enabler for their software. Even though case two is also a connected device, their price is not high enough for their customers to accept this kind of model. Case one sees software or service as necessary to use a model with subscription and are only planning it towards B2B customers. Case three sees no opportunity for it, as they have no realistic possibilities to incorporate software in their product. Case five is, however, optimistic to a model like this in the future, but will wait until their reputation will allow for such a model.

Case two stated that their problem is the cash flow, which forced them to eliminate the possibility of engaging in models with long payback time, such as subscription. Also, case one mentioned this challenge. Thus, the paradox seems to be that to be able to engage in recurring revenue, the start-up would need financial support to secure the cash flow until the customers have paid back the production cost or require so high payments from customers that it will not be accepted. A too high price would not fit the habits and bring enough convenience for the customers, that Yang et.al. (2015) points out as an important factor to succeed with a revenue model. As such, it seems as though the economics is not the most

important factor when thinking about recurring revenue, but how the product creates value for the customers.

For all the cases, the ideal situation was steady, monthly income. The common perception for a subscription model is that software, service or a very high price is needed and that B2B customers are more likely to accept a model like that.

## 5.4 Answers to research questions

### 5.4.1 RQ 1: How does hardware start-ups develop their business model?

The most surprising finding was the fact that case two and four expressed that their business model had not changed much over the course of their lifespan, contradicting to our expectations from the theory presented in chapter 2.2. The others indicated that they had made multiple changes, as expected from the theory. Case six, however, is placed somewhere in the middle as they had only considered two different models.

It is interesting that only case two and four believed their current business model would suit their long-term needs. However, case two was open to change if the customers expressed a desire for it. The others either felt the need to change over time or thought change would be necessary with the introduction of new products. The theory written on entrepreneurs and startup companies portrayed more adaptability to the surroundings, and that innovation in the business model is equally important as innovation in the product itself (Chesbrough, 2010).

From the literature, it is tempting to believe that case one and three are the most entrepreneurial cases in terms of their business model, however it is important to consider that skilled entrepreneurs are able to learn from others and avoid the same mistakes, so they can focus more on execution of their business model. Case two stated that them being so true to their initial business plan, probably was a coincidence.

It is hard to say something in general for all of the start-ups' development of their business model, except that testing the model to confirm or disconfirm it has been an important factor for all of them. Experimenting with the model seems to be a common denominator for all the cases in this study, but where some of the cases found a working model from the start, others had to experiment more to find the right. Those who found a working model early, has been the ones using the more traditional direct one-time sale models.

Another common denominator is the close relationship to the users and the customers through the process. As illustrated in Figure 4, this relationship connects several of the most important blocks of the business models. All the cases in this research are using this relationship actively to influence their focus and decisions when it comes to the product aspect and the business aspect of the start-up. Creating community of users seems to be beneficial situation, even if this is done purposely or not. The product specifications and value propositions are both highly influenced by this contact, but also the revenue stream is affected. In fact, even those who have yet to sell their product, has confirmed that their model will work through this contact, thus the need for additional development in the business model would not be

necessary. Therefore, the findings indicate that hardware start-ups develop their business model until it is confirmed. Once it is confirmed, they will be likely to carry on with the chosen model until their product or offering change.

#### 5.4.2 RQ 2: What are the most important factors for hardware start-ups when choosing their price level?

The study reveals a quite unison perception that price is a direct result of the functionality of the product. In order to mitigate the risk of being competed out of the market by bigger actors on price, the start-ups are prioritizing premium products of high quality. It seems they are building brands that front high quality and use partners to gain credibility. This corresponds to Sarasvathy's (2001) portrait of entrepreneurs as people who develop strategic relationship instead of doing competitive analysis. Several of the cases allow themselves to use more expensive components to maintain the image of being superior quality wise. Thus, they assess competing on price will not be necessary.

All the cases exhibit value-based pricing, which basically means that the product will have features that are so valuable to the customer, that they are willing to ignore the price aspects. The core focus of in the product development are these features. They build their brand around delivering high quality products that the users want. Thus, the pricing strategies in this thesis has been focused on increasing the willingness to pay.

#### 5.4.3 RQ 3: How does their business model development and pricing strategy relate to their product?

The business model development and product development are, in general, seen as two different aspect of a start-up. This study shows that as the product is developed for the user, the business model and pricing strategy is also being developed to match the user's preferences. Even though all the cases would prefer a model ensuring recurring revenue, only one case is doing it because it suits their customer's preference for their product.

For the start-ups in this research, the price is a function of the product, not the other way around, and the user is the most crucial connection between business development, hereunder pricing strategy, and the product itself.

## 6 Discussion

This chapter will discuss how this study and the findings correspond to the purpose of the study and the contributions stated in the introduction chapter. The discussion will lead to a conclusion and implications for future research, presented in chapter seven.

### 6.1 Development of business model

Interestingly, several of the cases that successfully have started selling expressed that their business model had not changed much over the course of their lifespan, contradicting to our expectations from the literature on entrepreneurs. We found that entrepreneurs have a very individual approach to the development and creativity of their business models. Entrepreneurs who are able to see opportunities, may also be able to construct the most expedient model from the start. However, this is not true for all, and those who initially have been using a lot of time to test define their model, also seem to be more inclined to change it in the future.

Where literature portrayed business plan as a long time strategy for the firms (Bocken et al., 2014), we found that the entrepreneurs do not have such long time aspects, and some of them do not even have a traditional business plan, they rather test their ideas for different models and put the best working model to action. This reflects Sarasvathy's (2001) idea of entrepreneurs starting off without concrete goals, and let them emerge, as well as the principal of experiential learning, introduced by Baron and Henry (2010). It also shows that not all of the choices are made with certainty, but rather with a dynamic approach to what the business model should be. This dynamic and changing approach is supported by Trimi and Berbegal-Mirabent (2012) and Baron and Henry (2010) as characteristics of entrepreneurs. One of the reasons for the lack of prioritizing the business plan, might be that the start-ups have to deal with being in such a temporary state (Ries, 2011). When the environment is changing, and uncertainty is always present, it is understandable that they do not prioritize making long time plans. Blank and Dorf (2012) states that one it is disastrous for a star-up to act as a small version of a big company. It seems like all the cases in this research exhibit this way of thinking in terms of the importance of business plans, contradicting to, amongst others, Bocken et al. (2014) who base their view on matured companies.

There are numerous sources in the literature that support that business models should be dynamic, for instance Trimi and Berbegal-Mirabent (2012) and Baron and Henry (2010). However, we have not identified literature underlining that the degree of the expressed flexibility is related to the individual entrepreneur's attitude towards business modelling. Also, several of the interviewees expressed that changing their model would only be necessary if the customers change their habits or preferences, thus proving that they consciously recognize the importance of a dynamic model. A curious observation from the study, is that the companies that have been working closest with their customers are also more inclined to adapt their business model towards their customers without experimenting. While the start-ups in this study do not use their business plans as long-time strategies, this does not implicate that they are more experimental. In fact, the cases that initially tested few models, did this because they were able to identify their customers first and adapt their models to their

preferences. Several of the cases in the study that considered few models had already confirmed them, and even sold. This is an implication that high degree of experimenting in the business model not necessarily reflect the start-up's ability to connect with the user and succeed with sales. In fact, it seems innovating the business model is not necessary unless the customers change their habits or if the product or the customer group change.

Not surprisingly, the findings in this study shows that the most important factor for succeeding with their business model is tailoring it to their customers. Therefore, the experimental approach to the business model in terms of revenue model might not be the most preferable way to develop it. However, it seems to be important to find the strategic partners that will enable the start-up to make the ideal product and revenue model.

## 6.2 Pricing strategy as competitive advantage

From the theory of pricing, value-based pricing is based on including the features that best can increase the product's value for their customers (Smith, 2016). Interestingly, it seems like this is a very common way of differentiating against competitors and substitutes. The cases use high quality performance and add features that are valued by their customers to defend high prices and higher margins. They all give the expression that price does not matter as long as the quality or performance is sufficient, and demonstrate that the business model can create value by enhancing the customers' willingness to pay (Amit and Zott, 2007). They use this as a way to create a competitive advantage. However, it is interesting to see that this way of differentiating is the preferred one. Even though entrepreneurs are portrayed as people who can see and exploit opportunities (Thomas and Mueller, 2000; Bolton and Thompson, 2004), the literature did not provide information that entrepreneurs prefer quantity over quality, as this study shows. This study indicates that hardware start-ups prefer being perceived as prestigious brands with high quality products.

## 6.3 Recurring revenue, a misconception

As expected from literature, there is a common perception that recurring revenue is linked to software or service (Aria, 2012; Yang et al., 2015). The majority of the cases dismissed that recurring revenue was possible for their product even though they actually did have elements of recurring revenue in their business model; some of the cases offered both upselling and accessories as a part of their business model, without acknowledging this as a recurring revenue stream. There were also two companies aiming for licensing models, with royalties, as preferred model, that stated they were not primarily focused on recurring revenue at the moment. They all excluded methods such as accessories and upselling, which leads to believe they do not assess these methods as recurring revenue, contradicting the what the literature suggested (DiResta et al., 2015). Thus, it seems like the term recurring revenue is basically understood as subscription in the start-up environment, probably caused by the emergence and increase of software revenue models, leading the start-ups to think about revenue models this way.

The findings suggested that all of the cases ultimately dreamt of a steady, predictable, monthly income. Little evidence that indicates recurring revenue is a growing trend for hardware start-ups doing B2C has been found. The B2C start-ups believed it would appear repelling for the customer to pay a monthly fee for their products. The cases that did not have models ensuring monthly income explained their choice of not doing so by customer's convenience and habits. The fact that software or service was not a part of their product was also a reason, but this goes back to the customers' habits, as they are assessed to be more used to these models for service and software. The B2B start-ups in this study, however, were more inclined to aim for models with recurring revenue and had already future plans for how to implement this.

## 6.4 Business development vs. product development

All of the cases in this study, except case five, decided on a product to make, and then found the users. They started out with a vision of a specific product that they wanted to make. Chesbrough (2010) underlined the importance of innovating both the business model as well as the technology of the business. However, all the cases, with exception of case one and partly case three, have been focusing mostly on the development of the technology. Taken figure 3 into consideration, it seems like hardware start-ups spend a lot of resources on developing their technology compared to the anticipated ROI. Even though developing the product is important to get to the market, Chesbrough (2010) suggests they should be focusing more on the business model development in close cooperating with their users. This implicates that hardware start-ups do not prioritize innovation in their business models as high as for their product. The literature said little about the customers' role as the link between the business development and the product development.

There are, however, existing literature on design thinking as a method of product development and lean start-up as a way of product and business development, respectively. The main differences between those approaches are focus on product or business and are described by Müller and Throing (2012). An interesting finding, is therefore, that all the cases in this research has put the user in the center for both their product development as well as their business development, which is the basis for both these approaches. All the cases have been using their customers actively to understand what features would make their product stand out from the existing solutions, and all of the cases have used their customers to develop and test their business model with the same purpose. Making a quality brand and active contact with customers and users seems to be more important than creating plans with long time perspectives. When putting the users in the center, and adjusting the model for their needs, all the cases exhibits an understanding that the business model must be flexible and dynamic if that is what the customers want.

# 7 Conclusion

## 7.1 Filling the literature gap

This study has investigated how hardware start-up companies develop their business models, pricing strategies, with focus on recurring revenue, through a qualitative study. The study did enrich the literature with empirical coverage to understand the underlying and most important factors for hardware start-ups' choice and development of business model. The empirical coverage provided in this study is relevant in time, as all the cases are still in the start-up phase.

The hardware start-ups in this study examined in this study develop their business model by finding the customers and using them as strategic partners. The model is tested with these partners, tailored to them and valid as long as they prefer it. It should be changed accordingly to the customers to fit their preferences and appear convenient for them. Both the product and the business are developed with them in the center. This is the focus of existing literature on lean start-ups and design thinking (Müller and Thoring, 2012), respectively. This empirical study found that the preferred pricing strategy for hardware start-ups is high price enabled by one-time direct sales. All of the hardware start-ups dream of subscription models, but no one has tested such models without an enabler, such as software or service. The reason for this, is that this will affect the cash flow for the start-up, as it with a subscription model will take longer time to get back the money used for producing the product, thus holding up money, which start-ups cannot afford. Another reason is that the customers are not used to such pricing strategies yet, and do not experience it to be convenient or value-adding enough. Even though literature suggests other methods for recurring revenue (DiResta et al., 2015), these are not considered as equally rewarding by the start-ups.

The underlying factors for choosing the price and to gain competitive advantage are high quality and to avoid competing solely on price, thus creating a brand that their customers perceive as a quality brand. Another new finding is that the initial attitude towards the importance of developing the business model seems to affect how they later prioritize this. It seems starting off a new company with an attitude that reinventing the business model is important for the success, this attitude will stick, and it will be more likely that the model is developed and change in the future. However, the opposite of this does not seem to implicate a less successful model, rather focusing on configuring the model to the customers' preferences in sprints when needed.

The product is also affected by the users through feedback. As far as the feedback goes, start-ups doing B2C use the feedback from already existing users, while B2B to a higher extent use strategic partners from the start of the development phase. This yields that start-ups doing B2C are more inclined to test new product ideas by developing only the key features and selling to early adaptors, which is found as a suggestion in the literature on lean start-ups (Ries, 2011). B2B start-ups, on the other hand, use fewer partners to dig deep in the understanding of the problem, which is a method found in the design thinking framework

(Müller and Thoring, 2012). Thus, the B2B need more development time, as well as they in general create more technologically advanced solutions than the B2C cases in this study. However, the product development is often more prioritized for both, which is a weakness according to existing theory (Chesbrough, 2010). No real evidence is found in this study to support Chesbrough's (2010) view on this.

Based on the results on this thesis, we believe that new hardware start-ups better can learn from others' experience and understand the reasoning behind the decision made, thus providing them insight to do choices in their business development based on experiences.

## 7.2 Implications for hardware start-ups

Start-ups who has their core product related to a hardware, should strive on keeping the user in center of all aspects of the development process, business-wise as well as product-wise. Establishing a brand that is associated with high quality and set a relatively high price, will lead to a competitive advantage. A high price can be protected by high quality and desirable features. It is important to involve customers early to map out these features, and focusing on those for the product development, as well as using them to verify the pricing strategy. Close cooperation with a few users and potential customers from the start should be the focus to determine both of these aspects.

Executing value-based pricing will help the startup differentiate from other companies. Close contact and the establishment of communities based on the product will help start-up companies engage enthusiasts that will be faithful towards the start-up.

## 7.3 Limitations

As stated in chapter 3.5, this study has its limitations. The limitations of the results are affected by those. Additionally, some limitations have been visual throughout the study, affecting the result.

This study is restricted to Norwegian start-ups. There might be geographical differences between the start-up communities in the different countries. For instance, Norway is a high-cost country, which makes it even harder to compete on price, as labor and living costs are high. This might have affected all the start-ups in this study in their choice of both pricing strategy and product specifications, as it is hard to compete on price on a global scale from a high cost country. Even though the start-ups in this thesis are experienced, the authors have no guarantee that they will survive and be sustainable in the long run, thus the result of this study may not reflect important success factors for new start-ups but describe the current situation at the time of the study. However, the majority of the chosen cases have already sold their products and have established themselves.

## 7.4 Suggestions for future research

### 7.4.1 How sustainable are the rationales

Follow up studies of the respective cases over time. As this thesis helps to understand the start-ups at one point in time, follow-up studies of the same start-ups would help to understand how decisions in terms of business model and pricing strategy impact long term sustainability.

### 7.4.2 Lean Start-up and Design Thinking

The literature review did not deal with Lean Start-up or Design thinking. This is because the initial focus of the thesis was related to recurring revenue. As the study was carried out, we found that the scope needed to be broadened. However, the results indicate that there are several factors linking the cases to these approaches. Especially the B2C cases seemed inspired by the ideas of lean start-up, whilst the B2B cases, in particular case four, seemed inspired by design thinking. The B2C cases all started with a product idea and then found the right customers by testing the interest in a vast variety of potential customers, which is the base of the theory on lean start-ups (Ries, 2011). Starting with a problem and conducting in-depth interviews and empathize to understand the problem in qualitative in-depth research, however, represent the core idea behind design thinking (Müller and Thoring, 2012). A new study analyzing the use of these tools, combined with analyzing their future activity, could unveil if these tools are being used consciousness or by coincidence if they are promoting the success of the start-ups or if they are time thieves.

### 7.4.3 Recurring revenue in the future

The users' attitude towards different revenue models are affected by their habits and preferences, as well as their perception of convenience, quality and so on (Yang et al., 2015). We assume to see models in the hardware sector being even more shifted and focused on recurring revenue in the future, and that the first successful introducers of these models will remove a barrier in the users' habits. Thus, changing the customers' attitude towards these. Although literature suggest a variety of methods to achieve recurring revenue, the attitude of the cases in this study reflect that it is models ensuring steady, monthly income they desire when the topic is recurring revenue. Even though we found little evidence that such models are currently being used by hardware start-ups today, we found that several wants to try this in the future. A study on the impact of the early introduces of these models, how they affect a start-up's cash flow and how they affect the users' habits is therefore relevant to understand how these models can become sustainable for hardware start-ups.

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