Aalto University
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Managing New Ventures and Knowing Whether You Need to Pivot Your Business Model

Evidence from the Finnish IT sector

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Research Objectives

Corporate agility is considered to be a key competitive advantage of startup companies developing new products when compared to larger corporations. With the now popular Lean Startup -methodology suggesting companies should make swift decisions to change their strategy and business model in uncertain new ventures, companies are supposed to know very quickly whether a business model is going to be successful or not. The purpose of this study is to understand why companies make radical changes to their business model and how they try to ensure at a relatively early stage that a business model is likely to fail, and that the most prudent action to take is to change trajectory and focus on another business model. Subsequently, the study seeks to clarify how agile companies develop their products under high levels of uncertainty.

Methodology

The empirical data for this study was gathered from eight semi-structured interviews with founders or early investors from growing Finnish IT startup companies. The respondents were selected as they have been involved with their respective companies from conception or from a very early stage and due to their top management position, the interviewees are very knowledgeable about all the reasoning behind the strategic decisions their companies made throughout the lifecycle of their core product offering. The interviews were analyzed using a systematic coding process.

Findings

The findings of the study indicate that companies either pivot due to a prolonged period of disappointing sales performance, or due to the new opportunities presented by experiments with new business models that lead to an immediate impact in customer satisfaction and revenue growth. The study indicates that disappointing performance is a sound basis for pivot only after multiple iterations on a business model, as it then becomes clearer that progress is too slow to reach desired performance levels and financial trouble is already visible in the horizon. Another finding of the study was the temporal differences between pivots that arose from negative performance and positive surprises from experiments.

Keywords New product development, pivots, trial-and-error learning, experiments, Lean Startup

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Glossary

Customer development	Developing new products closely with customers either by collaboration or behavior analysis through data.
Lean Startup -methodology	Management methodology for developing new products and services. Popularized by Eric Ries in his 2011 book *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses.*
MVP	*Minimum Viable Product*. The first version of the new product or service that is released to the public. Goal is to learn whether there is any actual customer need for the envisioned product.
NPD	*New Product Development*
Pivot	Radically changing the product strategy and business model. For example, a pivot can lead the company to radically change their product feature set, the target customer segments or revenue model.

1. Introduction

1.1. Background and Motivation

693 million euros. That was the 2015 *net income* generated from revenues of 2109 million euros for the Finnish mobile-gaming startup Supercell, a company that was founded just 6 years earlier in the summer of 2010. Supercell has become a phenomenally successful startup within a remarkably short time period. Media is filled with discussions and interviews from the company's CEO Ilkka Paananen, trying to dissect some of the key factors that have led to the company's extraordinary success. Why is it that Supercell has become so successful?

The people and company culture at Supercell have been constantly mentioned as some of the key factors that have made the company so successful; "The best people make the best games" has been a popular quote by Ilkka Paananen in the media. He has also stressed that he likes to give great freedom and autonomy to the game developers - to the extent that his goal is to "become the least powerful CEO in the world" (Kelly, 2013).

However, it seems that there also other factors in addition to smart employees and autonomous business units contributing to the startup's ability to bring hugely successful products into the market. Compared to larger corporations, one key advantage of startups is considered to be organizational agility (Weiblen and Chesbrough, 2015). Even though larger companies are armed with superior resources, studies have shown that large companies are also prone to suffer from organizational inertia and added layers of bureaucracy that limit their adaptive capabilities (Gilbert, 2005; Tripsas and Gavetti, 2000; Christensen and Bower, 1996).

Taking a more detailed look into Supercell's short history one can start to see the importance of organizational agility and how it relates to the company's success. Supercell started their journey back in the early spring of 2011 by launching the game *Gunshine* on Facebook. The company's premise was that since Facebook is a huge platform with hundreds of millions of potential gamers, the company could quickly gain a huge user base similar to the success Zynga has had with their Facebook-games.

As Supercell noted that most games on Facebook are really simple, they decided to take a different approach and launch a deeper game with more complicated game mechanics in order to differentiate from the competition.

However, the game did not meet the expectations of the founding team and the early-stage investors at Supercell. *Gunshine* did not attract enough players and was not generating as much money as the company had hoped. After seeing the Facebook-game leader Zynga's financial statements, the founders realized that Facebook-games as an industry are not really that attractive. Thus, already in the fall of 2011 the team made a *pivot* and decided to shift their focus completely for mobile and the newly introduced tablets despite having a number of new games under development aligned with their old strategy. This radical shift in strategy also meant that Supercell proceeded to kill all the existing games under development and to start completely from scratch (Saarinen, 2013; www.supercell.com).

Following the company's first pivot, Supercell has become well-known for the fact that they have multiple games simultaneously under development on any given time, but only a small percentage of these games will eventually be published. Currently Supercell has only four games available for consumers on mobile and tablets: *Clash of Clans*, *Hay Day*, *Boom Beach and Clash Royale*. In fact, according to Ilkka Paananen the company celebrates their failures (games that are killed) with champagne.

So why is Supercell celebrating failures? One reason is to promote a culture where the employees are not afraid to take risks and innovate. The other reason is that the company believes it can learn from its failures and thus improve as a company (Strauss, 2013). And not only does Supercell learn from failures at the point when they realize they have to kill their games, but the company does constantly test various aspects of their games and their business model throughout the product lifecycle in order to create the next hit that is appealing to a wide audience.

Much due to the success of fast-growing and innovative companies like Supercell, popular interest has recently surged in the area of agile new product development (NPD) and the idea of failing fast and often in order to learn and eventually succeed. The idea that startups and larger corporations active in NPD should avoid getting married to an initial vision and business model was popularized by Eric Ries in 2011 with his book *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to*

Create Radically Successful Businesses. Ries argues in his book that companies developing new products and services should expect to experiment and fail a lot in order to eventually succeed.

This area in NPD has also recently garnered academic interest as well, as researchers are trying to understand the processes that agile companies implement in order to build successful new products and services – and stay ahead of competition.

One core idea of learning quickly is that companies should be able to make radical strategic decisions or pivots concerning their products as quickly as possible. This is done in order to reduce waste (time and resources) that would go into developing the new product or service into a direction that is not attractive to customers or does not meet the company's economical goals.

However, there is a research gap regarding this process of learning quickly from failures and making pivots: How can companies ensure that the decision to pivot has enough supporting data in order to be the prudent strategic choice to make instead of pursuing the original idea and staying on current course? Also, what type of data is needed to support strategic pivots in the first place?

This master's thesis paper is motivated to find answers to these questions and fill the research gap in academia of how agile companies actually make radical strategic decisions quickly – a quality that really is a major reason why these companies are called agile in the first place. The problem reflects the broader theoretical theme of how agile companies can generate experiences that enable them to learn quickly and enhance the probability of success of new ventures.

1.2. Research Questions and Objectives

This research paper is themed around the Lean Startup -methodology that is now very popular in startup circles. Lean Startup advocates argue that the methodology is useful for managing NPD because it helps companies to cost-effectively develop new innovative products that appeal to a wider audience and provide a viable business model. An essential part of the methodology is that new products are developed in a 'lean' fashion where companies minimize any possible waste of resources, namely time and money. Importantly, the methodology suggests companies should strive to experiment a lot, and therefore be prepared to fail quickly and often and use these experiences in order to learn and adapt the business model in a quick fashion. It is argued that this process helps companies to more quickly find the right direction for NPD and discover whether their new product can be a commercial success or not, and whether it is worthy of the long development process required to bring the product to market and develop a viable business model.

With the Lean Startup -methodology currently quite popular in Silicon Valley and being taught in Harvard Business School, many entrepreneurs and managers in charge of developing new products are interested in applying the ideas behind the methodology. A multitude of books have been written on Lean Startup and how the methodology can be implemented in companies developing new products. For example, Ries (2011) does offer multiple success story cases as examples in his book, such as the cases of IMVU, DropBox and AirBnB, in an effort to show how the methodology can be used in practice for startups. However, there is limited academic research done specifically on the Lean Startup -methodology. Some academic studies (Patz, 2013) have aimed to define the essence of Lean Startup -methodology, and other studies (Kulse, 2012) have made efforts to empirically test the effectiveness of the methodology in a case company.

However, despite the lack of focused research on the management methodology itself, the basic ideas behind the methodology have been studied since the 1990s. These important elements that are closely connected to new product development research include experimentation and trial-and-error learning (Ott, Eisenhardt and Bingham, 2017; Bingham and Davis, 2012; Andries, Debackere and van Looy, 2013), learning from failure (Khanna, Guler and Nerkar, 2015; Corbett, Neck and DeTienne, 2007), active customer involvement in NPD (Conway, 1993; Radosevici and Yoruk, 2012; Coviello and

Joseph, 2012), testing markets with low-cost probes (Brown and Eisenhardt, 1997), agile software development (Poppendieck, T. and M., 2003; Salo and Abrahamsson, 2008) and lean manufacturing (Biman, Uday and Pankajkumar, 2014).

Together with Lean Startup literature, empirical research findings show these various elements of NPD are value-adding activities. The research has not only studied whether the processes add value to NPD, but also give insights into how they can be applied by companies in practice in order to promote agility. However, with empirical research and Lean Startup literature suggesting how companies can learn from experiences and how these experiences can aid in swift strategic decision making, the existing research and sample cases still leave us with a problem of how corporate agility is applied in practice when it comes to making pivots during NPD. Lean Startup advocates suggest companies should make an MVP that is good enough to provide the key value proposition, and that experimental learning should be used to quickly make decision of whether the developing company should stay on the current development path or whether they should pivot. However, how does the developing company know that their MVP is viable enough to make such calls? How does the company know that they have enough data to ensure that a pivoting decision is the right strategic move, or that the company should still keep pursuing the current vision and business model instead of pivoting?

The problem arises as it could be argued that a too 'minimum' product that is not fully developed might not be well received by the market because of just that – the product is not good enough in terms of design, feature set or some other factor, even though the key value proposition is included and provided in the product. Maybe the existing vision is the right one to follow, but the product fails in the market not because the product idea is bad but because the execution is bad. Lean Startup literature and research on experimental learning suggest that even low-cost probes and not complete products should be enough for the developing company to know whether an idea has merit in the market or not. However, this thesis challenges this suggestion and uses empirical data via interviews to find either supporting or invalidating evidence to provide more empirical ground for quick decision making. The study aims understand what are the key factors and elements companies to make pivots or persevere with the current vision.

The purpose of this master's thesis is to find clarity to what are the key factors and elements that companies utilize to make pivoting decisions, or what factors support the current vision and gives the developing company confidence in persevering on the current path and business model. The study

limits the focus to Finnish companies in the IT sector, as the IT sector is a fast changing environment where adaptability and agility is a key success factor. More specifically, the research questions for my study are:

1. *How and why do companies doing new product development end up doing pivots?*

2. *How do companies in the case of a pivot minimize the risk that the underlying problem was with the 'idea' and not the 'implementation'?*

3. *How do companies systematically test new products throughout their lifecycle in order to reduce uncertainties related to new product development?*

In addition to understanding the reasoning behind pivots and changes in business model and strategy, the goal of the thesis is to understand how new innovative products are developed and tested in practice during their lifecycle. The development processes of new products are closely related to strategy and possible pivots, as companies base these key decisions on data. It is useful to understand how the rigorous testing process and Lean Startup -methodology is implemented within agile startups, and what type of data companies gather to base strategic decisions on. A detailed picture of product lifecycle from ideation to commercial success would give readers a better idea of how they can implement agile and lean methods when involved with NPD. In addition to clarifying how and what type of data companies collect to base decisions on, it is hoped this thesis study helps to provide a better understanding of what are the key factors that companies use to select their business model and either stay with the current business model or make pivots that significantly alter the strategy of the company.

The theoretical framework in this thesis examines in detail why corporate agility is a crucial element in developing successful new ventures, what processes are found to be most useful ones to reduce any uncertainties in NPD, and what type of factors allow companies to make agile strategic decisions. Part of the theoretical framework discusses in more detail the core elements of the Lean Startup -methodology, and the latter part has a larger focus on reviewing academic research findings on the core principles of Lean Startup -methodology to build the foundation for data analysis in the later sections of this thesis.

2. Theoretical Framework

2.1. First-mover Advantage Does Not Guarantee Success with Innovations

Newly formed startups usually revolve around a single product or service to be developed. In order for new products to succeed commercially, common wisdom says one should differentiate the product from existing competition in one way or another in order to attract customers. Steve Blank (2005) argues that there are essentially four different types of categories for startups:

- Bringing a new product or service to an existing market

- Bringing a new product or service to a new market

- Bringing a new product or service to an existing market and trying to resegment that market as a low-cost entrant

- Bringing a new product or service to an existing market and trying to resegment that market as a niche entrant

In general, the identified categories are not limited to newly found companies but apply for any type of new product development (NPD) efforts from larger corporations that are trying to innovate as well. Even though larger corporations rarely focus all their resources in NPD due to exploitative business models dominating the incoming revenues and profits, NPD and R&D activities are still considered critical for the long-term survival and success of companies, as products ultimately have limited lifespans. Thus, companies need to reinvent their product offerings in order to avoid the declining stages of product lifecycle.

Today's speed of technological development has significantly reduced product lifecycles, especially in the technology industry. This is one key reason why exploratory business activities and adaptive capabilities are so important in the modern business environment. Tushman and Anderson (1986, 1990) found in their studies that there is an identifiable technology cycle where dominant designs, or generally accepted market standards, follow an era of incremental change. From time to time new

technological discontinuities arise in an industry that shatter the existing equilibrium and dominant design, and these discontinuities are followed by eras of ferment when there is intense design competition in order to create the new dominant design that becomes the accepted market standard.

Interestingly, Tushman and Anderson (1990) take note that when a company creates a new innovative product, it is often not the innovating company that is able to establish the new dominant design and reap the major commercial benefits in the end of the ferment era. Instead, the follower-companies who learn from the first-mover's mistakes make their own versions of the innovative product and edit it in various ways to better attract customers, are the ones who actually end up creating the new dominant design that is adopted by the masses. Gladwell gives an example of this phenomenon in his 2011 article by showing how the computer mouse was invented by Xerox in the late 1970s but was successfully commercialized and made popular by Apple after modifications that made the mouse more affordable for PC owners. It is also interesting to note that the eventual dominant design is not necessarily identified as superior for example in terms of technology when compared to competing products, but can for example be preferred by customers due to design or network effects (Tushman and Anderson, 1990; Teece 1998).

Other research studies have also acknowledged this phenomenon of followers outcompeting innovators, and Teece (1986) proceeded to identify the main factors affecting the success of new innovations: appropriability (intellectual property protection), complementary assets and dominant design paradigm. In in his follow-up research paper, Teece (1998) argued for the importance of dynamic sensemaking capabilities when companies try to profit from new innovations and create the new dominant design. Teece argues that sensemaking capabilities are crucial for succeeding with innovative products, as one key reason imitators often outcompete innovators is that their products are better optimized for end customers. Optimizing the fit between the product and its customers requires good sensemaking capabilities from the company and the team developing a new product.

These observations are some of the main causes for a growing interest in academia to study what companies can do in order to successfully facilitate exploratory businesses and seek new growth opportunities, and this way ensure long-term success. In addition, the internet and mobile device development have together created an economy where today countless startups and new products are created for global markets with relatively little capital and effort requirements. These developments

have further increased the interest for a NPD playbook dissecting what enables companies to develop new products successfully.

However, the fact remains that most of the new products and startups fail in the market. In fact, based on data from the Startup Genome Report (2012) that used over 3200 tech startups in their sample show that over 90% of startups fail within three years of inception. Similar findings were done by Marion, Friar and Simpson (2012), where the authors found that approximately 50% of startups and 40% of new products developed by large companies end in failure. Most common reasons for failure were found to be either the lack of market need for the product the company developed, or premature scaling that led to companies burning out cash at a rapid rate and eventually driving them to bankruptcy (Startup Genome, 2012; Griffith, E., 2014). The lack of market need is rooted in the problem that companies developing new products do not understand customer needs well enough to build an appealing product.

What can companies then do to understand customer needs? Lean startup -methodology suggests developing the new product or service step by step and letting customers try out each new version of the product. This type of approach is supported by a multitude of academic research studies, and advocated in literature exploring the lean startup -methodology. Studies indicate that involving customers in all steps of the NPD process is beneficial for the developing company and increase probabilities of success (Lynn et al., 1996; Callahan and Lasry, 2004; Laage-Hellman and Perna, 2014; Haapasalo and Suikki, 2006; Thomke and von Hippel, 2002; Taylor and Woojung, 2016; Ries, 2011; Maurya, 2012; Croll and Yoskovitz, 2013; Blank, 2005; Coviello and Joseph, 2012).

The research findings that suggest dynamic capabilities are key factors for entrepreneurial success and that high rates of failures in NPD are related to products not living up to customer preferences have helped the relatively newly founded Lean Startup -methodology to become hugely popular in Silicon Valley and other startup concentrations. This methodology popularized by Eric Ries in 2011 through his book *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses* essentially aims to guide companies to manage their NPD projects in a way that minimizes risk and maximizes probabilities for success by helping companies to find the so-called product-market fit (PMF), where the end product fulfills the desires and needs of customers as well as possible.

The following chapters will first take a more detailed look at the Lean Startup -methodology and its core principles. After this, the paper will review the academic research evidence regarding these core principles, sensemaking skills and dynamic capabilities of companies. By reviewing the existing literature on these areas of interest, we will learn what qualities and processes are shown to be important for companies to succeed in their NPD projects.

2.2. Innovators Need to Battle Uncertainty

"Most phenomenal startup teams create businesses that ultimately fail. Why? They built something that nobody wanted." – Eric Ries, (2010)

The quote from an article written by Eric Ries describes the problem that Lean Startup -methodology was developed to address. According to Ries' experience, many startups with a great founding team do not ultimately succeed in the market because they waste a lot of resources in building things that are eventually undesired by their target customers. As discussed previously, sample studies from the technology industry and Teece's (1998) identified success factors for new innovative products support Ries' arguments.

The Lean Startup-methodology was originally developed by entrepreneur Eric Ries, one of the co-founders at IMVU. Ries initially blogged about his ideas and eventually went to publish his critically acclaimed best seller book *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses* in 2011. The methodology is built upon ideas arising from agile software development, lean manufacturing and most importantly on Steve Blank's Customer Development Model, which is based on research studies showing that customer involvement in new product development (NPD) is beneficial and increases the likelihood of commercial success (Blank, 2005; Conway, 1993; Radosevici and Yoruk, 2012; Coviello and Joseph, 2012; Ries, 2011; Maurya, 2012; Croll and Yoskovitz, 2013).

Ries argues that all NPD projects entail a large amount of uncertainties in their business model and strategies. Is there a real need for our product and do our customers find it valuable? Is there a large enough market for our solution? Are customers willing to pay for it? Are we targeting the right customers? And so on. Thus, working on a new innovative product can easily waste a lot of time and resources if the product for example has undesired features or is sold to the wrong customer segments. Even worse, for smaller companies whose entire business depends on the success of a single product, a development direction that leads to a dead end can lead these companies into bankruptcy. In startup companies these problems are accentuated as they often are not initially self-sustaining but rather are

burning out cash as the founding team tries to come up with a profitable business model and get a product to the market that sells.

In its core, the Lean Startup -methodology intends to help companies to minimize the aforementioned uncertainties and risks by providing a systematic framework for managing any NPD project. The Lean Startup -methodology is a customer-centric management approach that combines ideas from lean manufacturing and agile software development into NPD processes that are academically shown to be useful (Ries, 2011; Maurya, 2012; Croll and Yoskovitz, 2013).

The main proposal of the Lean Startup -methodology is that companies should take a scientific approach to the NPD process and understand that all assumptions they have about the product and what brings value to customers are merely hypotheses that should be empirically tested instead of basing development decisions on prior market research or personal experiences (Ries, 2011; Maurya, 2012). There are research studies supporting this type of approach to NPD, and one study conducted by Read, Dew, Sarasvathy, Song and Wiltbank (2009) also shows that successful entrepreneurs share this type of thinking in their companies.

In their research paper Read et al. (2009) studied entrepreneurs who have founded at least one startup that has gone through an initial public offering (IPO) and achieved annual revenues of $200 million or more and compared them to a sample of corporate managers. The comparative study showed with statistical significance that the successful entrepreneurs were less likely than corporate managers to trust on prior market research when introducing new innovative products to market. Another key difference was that successful entrepreneurs approached NPD with a risk management perspective, focusing on affordable losses in order to find out whether it is viable to invest heavily into the new product. Corporate managers instead focused on maximizing returns and were more willing to invest heavily on the launch of the new products before knowing customer reception.

In addition, successful entrepreneurs were more likely to question and challenge the original plans and vision of which markets to penetrate, how to price the product or even the core characteristics of the product. This highlights the need and willingness to adapt existing plans according to new findings derived from actual usage data collected from customers. The authors of the study also argue that by collaborating closely with specific stakeholders, such as customers and partners, companies can better learn about the uncertain environment and understand what works and what doesn't. Read et al. (2009:

p. 15) sum up why successful entrepreneurs are less likely to commit to pre-made plans during NPD and are more interested to understand customers progressively during the product development process instead:

> *"First, by interacting with and "listening in" (Urban and Hauser 2004) to specific stakeholders, not only are companies in the initial stages of new market, product, and service development more likely to generate novel information, but the kind of information they generate is also more likely to be useful and valuable. Compared with traditional market research, this increases the likelihood of creating realistic new market opportunities because firms learn at every step what stakeholders will actually commit to and — just as important — what they will not commit to. This enables the firm to fail fast on poor product and service ideas and to bring good ideas to market sooner."*

The systematic scientific approach to NPD in Lean Startup -methodology begins with the notion that all the ideas and vision the developing company really has in the beginning are merely hypotheses of who the customers are and what they value, and that these hypotheses should be empirically tested instead of blindly trusting that you know the market well and all the key assumptions you have must be correct. The Lean Startup -methodology emphasizes this idea of validated learning, and this process is illustrated with the Build-Measure-Learn feedback-loop (Figure 1 below), which is the central framework for the Lean Startup -methodology to help companies developing new innovations scientifically (Ries, 2011; Maurya, 2012). The framework consists of three distinct stages: Build, measure and learn. These stages of the framework are next described in more detail to provide a clear understanding of the key elements of the Lean Startup -methodology and how NPD projects should be managed from this point of view.
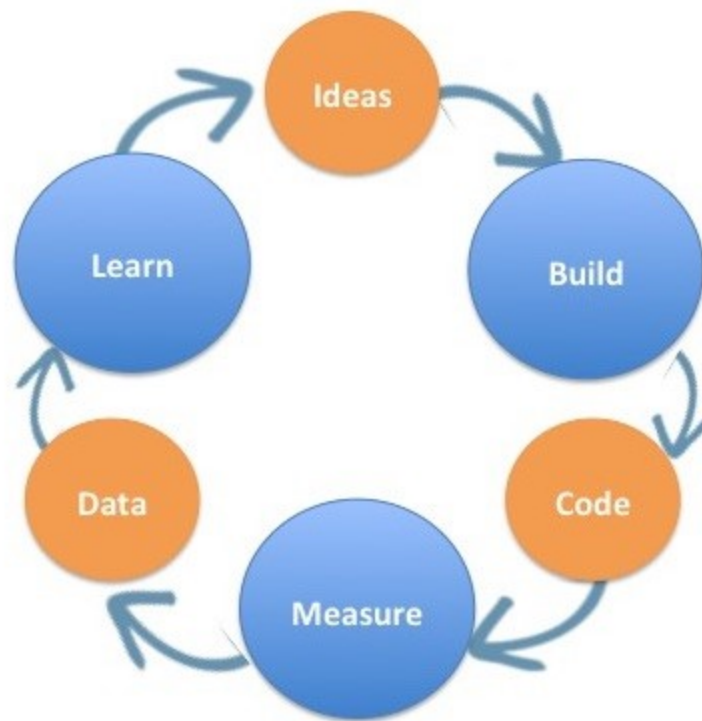
Figure 1: Build-Measure-Learn Loop. Figure adapted from Blank (2015).

Build

The first step in the Build-Measure-Learn framework is the Build -stage. At this stage the company should first acknowledge and write down all the hypotheses the founders have about the product and all the stakeholders. What kind of product or service should we create, who should we sell it to, what are our distribution and marketing channels and so on. Maurya (2012) in his book suggests using an adapted version of the business model canvas framework developed by A. Osterwalder called the lean canvas (Figure 2) to get a good snapshot of the various aspects revolving around the new business idea or product. The lean canvas is used to map out the initial hypotheses the company has about the product, customers and other stakeholders. This way the company has a better idea of what are the riskiest parts of the new product and what their minimum viable product (MVP) should be like in order to validate whether there is any real business for the product.

Figure 2: Lean Canvas. Figure adapted from Maurya (2014).

Using the lean canvas, a company should be able to formulate key hypotheses on what are the key properties of the new product, including how it should be manufactured and distributed, and who the customers should be. The MVP is the first version of the new product that is built in order to validate the key hypotheses at this stage. The MVP should be designed and built in the leanest way possible so that it successfully provides the main value proposition to the customers and provides a way to empirically test the key hypotheses the company has about the product at this stage. Usually this means that the MVP does not include the complete feature set envisioned for the final product, but only the core features that separates the new product from existing competition. The argument for building a lean MVP is that it is prudent to take an affordable loss approach to NPD, as it saves resources and is usually sufficient to quickly see if there is any demand for the new product (Ries, 2011; Maurya, 2012).

In some cases, it is possible to even create an MVP out of a power point slide deck or a mere teaser page on the web, such as in the case of DropBox. This approach is more useful when the new product

requires a large amount of resources to be developed up front, as this highlights the need to ensure market validation so that the large sunk costs related to NPD can be offset with a ready market of customers that would provide higher initial revenue (Ries, 2011; Maurya, 2012; Croll and Yoskovitz, 2013).

If the MVP gets only little or no traction, then the founders can at an early stage decide to not waste further resources in developing the MVP into a fully-fledged product as nobody seems to be interested in it.

Measure

With the MVP out, the next step in the NPD process congruent with the Lean Startup -methodology is to measure the usage and customer reactions to the product and to validate the key hypotheses the developing team had about the product. The goal of the MVP is not to be a major commercial success, but rather to validate the unique value proposition of the product. It is critical for the company to be able to measure the usage of the MVP and validate the team's hypothesis that the product adds value to users. If the product gains traction and there are customers interested in the value proposition, then through this validation the developing team can decide to further develop the product instead of killing it and looking for other ventures. It is also important that the company is able to identify the correct customer segment who find the new product or service most valuable and are willing to pay for it (ibid, 2011; 2012; 2013).

The MVP and all later updates for the product should always be designed so that they enable the NPD team to empirically test their hypotheses. At the early stages of the product these hypotheses usually revolve around what the customers actually need from the product and what features should be built and improved. Also, the team should validate that the customer segment they chose to target is the right one, which distribution and marketing channels are the most effective, and what business or pricing model is the most appropriate (ibid, 2011).

Ries (2011) suggests a few key processes for devising and measuring experiments that test the key hypotheses for the new product. Firstly, he advocates the use of Kanban boards that allow the

developing team to map out at which stages the ideated hypotheses and features are currently in the NPD process:

- Product backlog

- Actively being built

- Technically complete

- In the process of being validated

The point of the Kanban board is to aid in visualizing the value stream through which hypotheses and resultant feature ideas flow in the NPD process. Ries argues for a limited Kanban board size so that the NPD team can focus on validating only a few hypotheses at a time. By testing out only a couple of hypotheses at a time can the NPD team better focus their experiments and verify that any changes in the usage of the product are actually due to these specific experiments, thus making it easier to validate each hypothesis. Only after the team has empirically validated or invalidated a hypothesis, should it be removed from the Kanban board (ibid, 2011).

Lean Startup -advocates all emphasize the importance of having quality usage metrics to effectively test and validate hypotheses during the NPD. Ries (2011) suggests implementing the rule of "three A's" when it comes to metrics: having metrics that are actionable, accessible and auditable. Maurya (2012) and Croll and Yoskovitz (2013) argue that a good metric is one that is comparative, understandable and preferably a ratio or a rate. The attribute of comparativeness is especially important for gaining any insights as the team should be able to compare usage patterns and statistics of different time periods, groups of users and to those of competitors.

Naturally the type of metrics that are important for one company and product can be different from those of another product. Croll and Yoskovitz (2013) remind about this fact, but argue that software-based products and services can generally be categorized into six main business models, presented below together with typical key metrics to follow to improve the product:

- E-commerce

  o Revenue per customer, search engine optimization and search terms within website

- Software as a service (SaaS)

  - o Churn rates, engagement and conversion rates

- Mobile applications and in-app purchases

  - o Revenue per user and per paying customer, engagement and conversion rates

- Media sites

  - o Engagement, churn rates and ad revenue

- User-generated content websites

  - o Engagement and comparing different tiers and content creation

- Two-sided marketplace platforms uniting buyers or sellers

  - o Buyer, seller and inventory growth, inventory quality, sales volumes and conversion rates

Croll and Yoskovitz note that products or services based on any of these business models typically follow similar types of metrics to improve the product. The book of these two authors goes on to present the details and peculiarities of these six types of business models in order to help companies involved in software-based NPD to develop their products and business with concrete guidance and specific metrics to follow. The authors also present data that allows for NPD teams to compare to industry averages to better understand whether they are doing well or not with the product (ibid, 2013).

However, Croll and Yoskovitz and Maurya (2012) argue that it is helpful for all types of businesses to utilize the framework of so called pirate metrics in order to cover the key areas of the business model in order to guide and aid the NPD process. The general metrics to follow according to the pirate metrics-framework are:

- Acquisition metrics

- Activation metrics

- Retention metrics

- Revenue metrics

- Referral metrics

By following these general guidelines for what types of metrics to follow, the team involved in the NPD process should be able to effectively test any new hypotheses they have via specific metrics that allow to analyze customer behavior and whether the new features or updates lead to desired effects. In the earlier stages of the product lifecycle the acquisition and activation metrics are more important, and the retention, revenue and referral metrics become more relevant after the initial stages of product lifecycle. In all cases should the testable hypotheses be designed so that there is a quantifiable way to prove the hypotheses right or wrong (ibid, 2012; 2013; Ries, 2011).

Another efficient and popular way of testing out hypotheses quickly is to use split testing as a way of testing and optimizing new features. With split testing the developing team can for example test different versions of a new feature and see through customer behavior which one is preferred and should be chosen to be included in the product in order to enhance the product performance (ibid, 2011; 2012; 2013).

In addition, Maurya, Croll and Yoskovitz advocate the use of cohort analysis, in which the developing team compares a group of users or customers of a specific time period to another group of another time period, for example after a product update. This way the developing company can better analyze whether a product update or a new feature had the desired effect on the usage of the product or service by looking at how customers are using the product after the update and comparing them to customers that used the product before the update.

Learn

The last step in the Build-Measure-Learn loop is the learning phase, where the developing team should analyze the measured data. In this last phase of the loop, the developing team should be able to prove

their hypotheses about their product or business model either right or wrong and thus make a decision about future developments and strategy based on the what the team has learned through collected data.

In order to stay agile, Ries (2011) and Maurya (2012) state that the aim of the developing team should be to move through the Build-Measure-Learn loop as quickly as possible in order to swiftly discontinue any development paths that are not fruitful, and in turn to find a sustainable business model as quickly as possible. As soon as the team has validated or invalidated a hypothesis, they should move on to the next one and start again the three-step Build-Measure-Learn loop to guide themselves through the uncertainties regarding NPD by constantly testing empirically new hypotheses and making future development decisions based on the data from these tests.

Sometimes the developing team might have a hard time validating a hypothesis. Perhaps the customer data is not as encouraging as the team would have liked to send a strong signal that something about the product or business model works. In these instances, after multiple experiments when the team cannot validate a hypothesis and especially when the whole business model of the new product is not working well enough, the team needs to decide whether they should persevere on the current development path or pivot to a radically different direction. This is done by looking at all the data and insights the company has learned in order to make an educated decision on what direction they should take their company.

The pivot could be done for example by radically changing the product feature set, selling to a different market segment or perhaps by altogether changing the unique value proposition and switching to a completely different product. Especially in the last case if the developing company realizes that the unique value proposition they offer to customers does not solve a large enough problem for customers, even after many iterations to product feature set and trying to sell the product to different customer segments, then the developing team might have to make a pivot that requires a complete and radical change in the product or business model, and this way basically kill the product and its development as is (Ries, 2011; Maurya, 2012).

Blank (2005) suggests that companies should focus on their vision and try to find a paying target customer for their product, and only pivot if the team is unable to find a customer segment providing a sustainable business model. A complete change in customer segments often is considered a pivot by

itself as it also commonly entails other changes to the business model, but Ries (2011) identifies also other types of pivots that are common:

- Zoom-in pivot, where a single specific feature becomes the whole product

- Zoom-out pivot, where there product becomes a single feature of a larger product

- Customer need pivot, where the problem the product changes is not that important to customer and the company starts to build a different product that solves a different customer problem or need. This type of pivot usually leads to a complete change in the new product and essentially leads to killing the existing product as is.

- Platform pivot, where the product changes from an application to a platform where third parties can add content, or vice versa

- Business architecture pivot, where the business model changes from high volumes and low margins to low volumes and high margins, or vice versa

- Value capture pivot, where the revenue or earnings model is changed

- Technology pivot, where the underlying technology behind the product is changed to better serve customer needs

- Channel pivot, where the company changes distribution channels for the product to better reach target market

- Engine of growth pivot, where the company changes the fundamental growth strategy behind the product. Growth engines can either be paid, viral or based on stickiness where churn rates are managed carefully.

Ultimately, the goal for the NPD team should be to move through the Build-Measure-Learn loop as quickly as possible in order to develop the product in an agile manner. As NPD generally faces a large amount of uncertainties regarding what type of product to build and what type of business model to implement, it is key for the company to learn as quickly as possible how to build a sustainable business around the new product. Instead of relying on gut instinct, the team should empirically test all the

hypotheses and this way prove hypotheses right or wrong with data. According to Lean Startup advocates, this process should be effective in helping the team to develop the product and business into the right direction and avoid wasting precious resources in building a product nobody wants or is willing to pay money for (Blank, 2005; Ries, 2011; Maurya, 2012;).

The Build-Measure-Learn loop presented in the Lean Startup -methodology, however, is not without its problems. The process is strongly promoted as one where it is encouraged for companies to develop the MVP and new features as quickly and minimally as possible in order to see if it gains any traction and whether the new idea is worth pursuing any further. However, with such a mentality it is possible the developing company also forgoes new possibilities too quickly with very short-term evidence. Eric Ries (2011) explains in his book that a company developing new products should not worry too much about product design and user experience, as long as the MVP or further new business model ideas are able to provide the unique value proposition well enough. However, it can be argued that design thinking has become more competitive in a wide variety of industries and that it is today more difficult to get away with a product that is not well-designed than it was ten or fifteen years ago. What if users today demand higher product quality, and if they test a new product that provides value but does not function well enough or is too minimally designed they decide to not interact with the product any longer after the initial experience?

For many companies developing MVPs this can be a real challenge, especially if the product was not featured closely with customers during development. The developing company might actually have a good idea but due to bad implementation the usage data and discussions with customers do not show much promise or traction, and thus team might conclude the new path is not worth pursuing and pivot into other ventures. Even if the Lean Startup -methodology also states that pivots should not be based on merely one experiment, in some instances it might be required to either make larger investments up front in order to get a truly working product that is well designed, and there would be a huge gap between a MVP and a better functioning product. In these instances, companies following the Lean Startup -methodology might be inclined to pivot and discontinue the vision as the minimal MVP showed unsatisfactory performance and with that evidence the idea is not worth pursuing with huge investments.

2.3. Effectual Logic and New Venture Business Model Development

Empirical support exists for the Lean Startup way of managing NPD processes as well. The Lean Startup -methodology was popularized originally for startups as these companies are often reliant on a single product, and a failure to create a desired product often means the startup company would eventually be forced to shut down. Berends, Jelinek, Reymen and Stultiëns (2014) did an interesting study investigating the differences in NPD processes between small and large firms, suggesting that NPD best practices vary depending on firm size due to differences in firm capabilities and amount of assets. The study by Berends et al. (2014) adds new information to existing research universe, as most NPD research studies have focused on large firm R&D processes, and best practices derived from such studies are not necessarily be applicable to small, agile companies where the startup is dependent on a single product.

In their research paper, Berends et al. (2014) derived their basic framework from entrepreneurial research studies by Sarasvathy in 2001 and 2008, where Sarasvathy introduced two separate approaches for NPD: effectual logic, where the entrepreneur focuses on the capabilities of the company and figures out what types of goals could be accomplished with these means, and causal logic where the entrepreneur focuses on goals first and figures out what capabilities are needed to accomplish those goals. The crucial difference between the two is that the effectual logic is more iterative and opportunist in nature and focuses more on risk control by focusing on what is controllable by the firm. The causation logic on the other hand focuses on maximizing expected returns, and the company focuses on existing knowledge of what steps are needed to attain a goal. In case of high uncertainty and surprises, the effectual logic allows the entrepreneur to embrace any new and surprising information and adapt, whereas surprises are more likely to distort existing plans from a company following a causal logic (Berends et al., 2014).

In the study, Berends et al. (2014) wanted to focus on studying small companies, as they hypothesized that smaller companies are more likely to utilize effectual logic in NPD due to lack of resources that would in turn require these companies to focus more on internal capabilities and what could be achieved with limited resources. Due to this risk control approach, the studied companies were found to develop new products in a stepwise manner to test whether the team is on the right trajectory to build a

desirable product. Berends et al. (2014: p. 627) discussed the nature of this approach and how it leads to frequent iterations:

> *"The development trajectory occurred through steps yielding concrete outcomes, such as prototypes, while limiting risk and costs at each step, where outcomes drive resource commitments by feedback (not prediction). This allowed firms to regularly reflect on outcomes so far, and to incorporate changes, customer feedback, or additional resources and opportunities as these emerged in their environment. Correspondingly, whereas causal logic sets bounded goals and product definitions, effectual logic is open-ended, with goals and ideas crystallizing over time."*

The stepwise approach of small companies in NPD combined with a risk control approach encourages companies to reflect often on their NPD process, leading to pivot situations more often where the company must decide with available information whether they should move on to the next step in NPD, make radical changes to the product or to altogether discontinue the project in order to save resources. Berends et al. (2014: p. 630-631) continued how the structure of this approach generates situations where the developing team might end up making a pivot:

> *"They worked in steps toward tangible outcomes, such as the development of a new concept, a prototype, or subsequent variants of the same product. Individually, these steps contained little risk of financial loss, or at worst would result in affordable losses only. Such steps were punctuated by recurrent reconsideration on how to proceed further, in light of emergent circumstances. Such an iterative approach allowed firms to reexamine a project and to move it forward (or delay or terminate it) from moment to moment, with the latest information, as options and possibilities arose, while limiting the risks associated with any step. As part of this stepwise approach, activities were undertaken sequentially, not simultaneously: After each step, the small firm innovators reconsidered the project before embarking on another step, with the path forward emerging from results of prior action."*

In their research study, the authors found that small companies are more likely to use effectual logic in the earlier stages of NPD, but that over time causal logic becomes more prevalent, especially in the later stages of NPD when there is less uncertainty. The authors reflected on the results, reasoning that as smaller companies have fewer resources and often can only afford to focus on only one or a few projects at a time, they are directed towards a risk control approach that is adaptive and develops new products in an iterative step-by-step, lean manner for example by using low-cost probes to save resources. The authors highlight that with the effectual approach goals and product definitions are open-ended and they develop over time as empirical usage data becomes more available, which enables small companies to manage risks more effectively (ibid, 2014).

However, the authors also noticed that the stepwise approach to NPD used by small companies in the sample also led to longer lead times, which in turn can be a large issue in industries and business environments where timing is crucial for the success of the product. The longer lead times also burn up more cash when no products are on sale, and this may also risk the companies postponing or altogether cancelling new innovations as they are naturally inclined to focus on existing business performance in order to ensure steady cash flows and stay afloat (ibid, 2014).

Andries, Debackere and van Looy (2013) conducted another recent study to understand how companies undertaking new ventures develop their strategy and business model amidst uncertainty. The authors discuss how companies undertaking new ventures are prudent to work under an effectual logic and reduce uncertainties by experimenting a lot during NPD. In the study, this argument was further examined as the authors studied both companies that had a high initial focus on one business model with fewer experimentation, and companies that did not have as strong of an initial focus on a single business model but instead made a larger amount of business model experiments in an effort to diversify their bets that would allow them to find the right business model under uncertainty. Andries et al. found that companies with effectual logic doing simultaneous experimentation with multiple business models experienced higher long-term survival rates than companies focused on one business model that worked under a causal logic, even though the companies focusing on one business model had higher initial growth rates due to higher levels of investments on one business model (ibid, 2013).

Andries et al. (2013) also categorized experimentations to local search experiments and distant search experiments in their study. In local search companies make incremental, step by step changes to the business model as they learn about the impact of their experiments on each step, guiding their way

through NPD. On the other hand, with distant search companies radically alter their product by changing multiple components of their business model at once. The authors found evidence in their study that companies doing distant search did so mostly due to disappointing sales for a prolonged time of a year or more. The radical product altering indicates that in distant search companies were fairly confident their current trajectory would not lead to satisfying market performance in the future and saw the business model as one doomed to fail, and thus more radical changes were needed to correct the course and find growth via another business model trajectory (ibid, 2013).

Another interesting finding from the study was that companies doing multiple local search experimentation early on during product lifecycle ended up converging to a single business model that was found to be viable. Supporting the study by Berends et al. (2014), the authors also found that companies with effectual logic slowly moved towards a more causal logic in NPD after having focused on a single business model.

Bingham and Davis (2012) conducted another interesting study to understand whether companies sequence different learning methods, and whether these sequences have any implications on learning. The authors studied companies that had grown internationally and penetrated new markets unknown to them, and examined how these companies learned about the new target markets. The authors found that companies whose founders had little target market expertise tended to initially rely more on vicarious learning, where the firms first examine the behavior and performance of competitors in order to copy useful approaches by them, and to avoid any mishaps that competitors stumbled upon in their approach in the target market. The companies with more experienced founders in the target markets did not rely on vicarious learning initially, but instead relied on direct trial-and-error learning to better adapt to the markets.

Interestingly, the Bingham and Davis (2012) came to the conclusion that the inexperienced founders who relied on vicarious learning increased their number of learning processes to other direct methods, such as trial-and-error, experimental and improvisational learning, whereas the more experienced founders contracted their number of learning processes and mostly relied on the chosen learning process they initially leaned on when penetrating the target markets. An increasing number of learning processes increased the long-term performance of companies when compared to the companies that relied on only small number of learning processes in the long-term. The authors argued the reason why experienced companies relied on limited learning processes was overconfidence, which in turn hurt

their long-term performance. The inexperienced founders on the other hand did not suffer from overconfidence and instead were open to increasing the number of learning processes to become more efficient in the market and in any new market penetrations (ibid, 2012).

The implication from the research by Bingham and Davis (2012) seems to be that companies developing new ventures that are using more opportunities to learn are prone to benefit more in the long-term as they are mentally more open to learn than companies with limited set of learning processes in place. However, it is unclear from the study whether it is the general effectual logic, willingness to learn and lack of overconfidence in their knowledge of the markets from the inexperienced founders that helps long-term performance instead of the amount of learning processes used when compared to more experienced managers.

As discussed in this chapter, one effective approach for NPD is a stepwise process where the developing team constantly checks to see whether they are taking the right direction in NPD or whether the team should change course and pivot, supporting the ideas by Blank (2005), Ries (2011) and Maurya (2012). However, in order to make educated and sound decisions regarding what steps to take next in NPD, the developing team has to have supportive data to base their decisions on. It then follows that usage data gathered from customers are crucial keys to the puzzle when companies are making strategic decisions regarding the product, as revenue growth and improving metrics ultimately are the resultant of desirable customer actions and a good product-market fit.

In the next chapters, we will review evidence of involving customers in NPD: What are the pros and cons of actively involving customers in NPD, how should companies involve them and what type of customer data are helpful in guiding new venture progress. Understanding this aspect of stepwise NPD process is crucial in order to have a theoretical framework basis on which to analyze the interviews conducted for this thesis and why and how startups end up making pivots during NPD.

2.4. Customer Involvement in New Product Development

A core idea in the Lean Startup way of approaching the NPD process is to heavily involve customers in product development in order to learn fast by examining real usage data and to find the right business model for the product. By reviewing academic research studies on customer involvement in NPD in this chapter, we find that various empirical studies find support to the notion that involving customers in NPD is useful and in part contributes to the commercial success of new products.

Gupta and Wilemon (1990) argued in their research paper that the reason why innovating companies don't always succeed with their new products has a lot to do with the slow process of product to market, and that various uncertainties related to the product and the market are one of the main reasons why new products often get delayed. The authors explain that these uncertainties arise mostly from the lack of understanding of the target market. Gupta and Wilemon suggest that in order to reduce the uncertainties of NPD companies can identify and collaborate with lead users.

The lead user-concept was developed by von Hippel in 1986, as he argued that traditional market research is unreliable when it comes to new radical innovations. Instead, companies active in new ventures that involve high amounts of uncertainty should aim to learn directly from the marketplace in order to make better informed decisions in what types of features to build into the product offering and whom it should be marketed to. Von Hippel proposed that companies should aim to find lead user customers who have similar needs that will be general in a market place, but who face these needs earlier than the majority of a market place. Also, he stated that it is important that lead users are able to benefit significantly from the proposed solution of the company's new product offering.

In other words, companies should aim to find customers who have a real problem and have a significant need for solving that problem instead of customers seeing the newly developed product as something that is a "nice to have" but not an essential need. Finding these lead users is beneficial as they help the companies developing new products to understand what product features are needed and how they should best go about solving key customer problems. After identifying a group of lead users, the next step is to derive direct usage data by presenting the new product to them and then analyzing in

detail what are the specific needs the users have and how these needs should be fulfilled by the product (von Hippel, 1986; Urban and von Hippel, 1988).

The concept of lead users has strong similarities with the customer identification process discussed in the Lean Startup -methodology. The advocates of the NPD management methodology argue that it is important for companies doing NPD to decide who are the right initial customers in order to improve the NPD process. Blank (2005), Ries (2011) and Maurya (2012) emphasize that a key step in NPD is to understand who are the customers that benefit the most from the new problem solution and have a real need for the new product. Finding out what customer segment has a real problem that requires a new innovative solution can be identified by finding out people who have a problem that they are already actively trying to solve, but are not satisfied with the solution the existing products provide. The point here is that these potential customers who are actively trying to find solutions to their problems would be most active in helping the NPD team to build up a product that solves their problems via active and frequent feedback to any updates and queries the NPD team make to understand how to enhance the new product (ibid, 2005; 2011; 2012).

Maurya (2012) points out that customers who claim to have a problem but are not actively doing much to solve it are not that great first customers for NPD to act as lead users. These types of customers would see your new solution rather as a nice to have, and would likely not be too interested in the solution until it becomes mainstream. Thus, their user input in the NPD process is less helpful than that of customers who really need their problem solved and want to actively help the company to build a product that would solve their problem.

However, some studies show that lead users are not always useful and can even have adverse effects on NPD if the lead users are not selected carefully. For example, Lynn, Morone and Paulson (1996) found out in their study of four companies that lead users may actually guide the NPD in the wrong direction due to a lack of vision or foresight of what the new product could be used for. The studied companies had new products still under development as they were trying to understand what are the most potential applications for their inventions. The companies proceeded to show their products under development to selected lead users in order to get valuable feedback on what would be the best applications for the new products under development. As the lead users did not support the companies' original ideas on how to apply the new products and saw little value in the vision of the companies, the companies were to choose between intuition and customer feedback when choosing which direction to take the NPD.

The companies decided to ignore the voice of their lead users on how to apply the new products, and instead chose to follow their own intuition on which market to target and what features would be important to their products' success. This choice eventually led to hugely successful product innovations as the developing companies stayed true to their vision instead of following the voice of lead users.

As the study by Lynn et al. (1996) shows, picking the right customers to guide the NPD is not always straightforward, and the selected lead user group can potentially misguide the NPD process instead. However, the involvement of customers in the NPD process is not limited to lead users and a multitude of academic research studies indicate that understanding user needs is one of the most important success factors in NPD. As Lynn et al. (1996) state in their research paper about discontinuous innovations: "Its most persistent feature is high uncertainty" (p.10). Because of the inherent uncertainty related to NPD, understanding end user needs is critical and one of the most important success factors in NPD (Lynn et al., 1996; Laage-Hellman and Perna, 2014; Blank, 2005; Ries, 2011; Maurya, 2012).

An article by Ciccantelli and Magidson discussed the importance of involving customers in NPD back in 1993. The authors explained in their article examining product design efforts by companies that traditional market research fails in properly mapping out customer needs and wants because customer needs tend to be fleeting by nature. Customers themselves do not consciously know what they want and how they want to solve a problem or need they have, and therefore a gap exists between what customers say they want and what is actually the best solution for solving their needs (ibid, 1993).

This view by Ciccantelli and Magidson was further shared by Thomke and von Hippel in their 2002 article 'Customers as Innovators: A New Way to Create Value'. In the article the authors explain that customers do not fully understand their needs until they can try out prototypes of new products first-hand and see how well they actually solve their problems. This leads to a process where companies build prototypes, customers try them out and return with improvement suggestions that the companies must then again analyze to build the next product. The process is slowed down because companies are left with interpretation of what the customers want and what type of product should be built to solve actual needs, whereas the customer only knows exactly what the need is but are not so much concerned with detailed explanations on how that need would be solved by the product. Thomke and von Hippel suggest collaborating closely with customers and finding ways to let the customers take part in NPD, for example by providing them a user-friendly toolkit to edit the prototype themselves in a timely

manner. The authors conclude that this would make the NPD process more agile as it lets the customers iterate on product design themselves (Thomke and von Hippel, 2002).

A similar finding was done by Anderson and Crocca (1993) in their study of a book and magazine digitization project that Xerox jointly conducted with their customer university. Anderson and Crocca pointed out by analyzing the process and performance of the digitization project that "The difference between what users say they want to do, and how that actually is put into practice, is enormously instructive" (p.54). The authors saw that this phenomenon of customer behavior directed Xerox to build and design the product step-by-step together with customers, and that this process was largely different to traditional process where engineers produce finalized product features instead of probing for a simple and effective way for the customers to work around their problem.

Ciccantelli and Madison (1993) also explained that issues arise especially with new products because customers tend to be biased by existing solutions to their problems and therefore can have a hard time conceiving or understanding any radical and novel solutions to their problems. Thus, the authors argue that traditional market research with focus groups or surveys is ineffective, and a better solution would be to involve the customers in product design already in the earlier stages of NPD and focusing them on their problems instead of figuring out a feasible solution, which according to the authors' study is biased by existing solution alternatives. The authors conclude their article by urging companies to "get consumers involved in product and service development as early as possible and at all subsequent stages" (ibid, 1993: p.347).

Callahan and Lasry (2004) found further evidence to support the findings of Ciccantelli and Madison (1993). The two authors studied how product newness affects the usefulness of involving customers early on in the NPD process. The authors came to the conclusion that importance of customer input during NPD increases with product newness, and that companies doing NPD collaborate with customers more closely and intensively in the stages where customer input is important in NPD. Callahan and Lasry also studied the usefulness of customer input in different phases of NPD. They found that during idea generation and requirements (or feature) definition, the importance of customer input is strongly correlated with product newness. During the stage of technical development customer input was found not to be important, and even negatively correlated when product newness was really high. In the later stages of testing and product launch customer input was again found to be very important and correlate with product newness (ibid, 2004).

The results by Callahan and Lasry (2004) support the earlier conclusions by Lynn et al. (1996) that a probe and learn-process is indeed useful for companies involved in NPD. Interestingly however, Callahan and Lasry found that customer input importance increases with product newness only up to a certain level, and thereafter starts to drop off and become less important. The authors argue that this is because customers have less relevant insights and reliable information for truly radical products, and thus companies should also be able to follow their own vision when the new product is really radical in terms of market newness.

Lately, Taylor and Woojung (2016) further provided evidence and confirmed the importance and usefulness of involving customers early and often in NPD in a timely research paper. By conducting a meta-analysis of 35 independent empirical studies that analyzed the effect of customer involvement in NPD, the authors specifically sought to understand when and how customers should be used in order to enhance NPD performance in terms of operational, marketing and financial performance. Supporting prior empirical research findings, Taylor and Woojung found in their meta-analysis that customer participation in NPD is significantly positively related to all types of NPD performance except for new product marketing.

In the same study, the authors were able to conclude that customer involvement in NPD is especially useful in emerging countries, low-tech industries, in B2B and for small companies. Even though most of the existing literature have highlighted how high-tech industries would be likely to benefit the most from customer involvement in the NPD process due to stronger uncertainties in the market, Taylor and Woojung found contradictory evidence to these conclusions. Based on their research findings, Taylor and Woojung instead suggest that customer involvement in NPD is more useful in low-tech industries because it is easier to integrate and act on knowledge learned from customers compared to high-tech industries where utilizing this information can be more difficult. The finding that customer involvement is especially useful in B2B and for smaller firms is less surprising, as in B2B the customers generally have higher motivation to contribute to NPD compared to B2C customers, and thus B2B businesses can find involving customers in NPD especially impactful. Also, smaller firms were found to more quickly and effectively apply what they learned from customers during NPD compared to larger firms that often have slower decision making processes as they suffer from added layers of bureaucracy and organizational inertia (ibid, 2016).

Interestingly, Taylor and Woojung also found evidence that customer involvement is not always beneficial for NPD performance but can also be a harmful practice if done wrong. Their study showed with statistical significance that customer involvement during product development stage negatively affects NPD performance, even though it is highly beneficial during early ideation and later at the product launch. The authors' meta-analysis strongly indicated that involving customers during early ideation and launch stages not only directly improves new product financial performance due to better product/market fit, but also accelerates the time to market. In contrast, customer involvement was found to harm NPD performance during development because it was found to slow the time to market, which in turn led to decreased financial performance for the new product (ibid, 2016). This is a novel finding as customer involvement in NPD is commonly argued to be highly useful in all situations and for all types of firms. The findings of Taylor and Woojung highlight that there are instances when customer involvement in NPD can be less useful and slow the time to market, and which types of environments and businesses benefit the most from customer involvement in NPD.

The empirical evidence strongly argues for utilizing customers actively during NPD as this is found to be one effective way to reduce uncertainties inherent in new products and markets. However, there is mixed evidence whether involving customers actively is beneficial in all stages of NPD, or just in some parts of it with some studies indicating customer involvement is less useful in development phase as it can lead to slower time to market. We also learnt that there are arguments for seeking a specific type of customer segment as lead users, as they benefit the most of the hypothesized solutions and should be especially helpful in designing the product feature set. However, companies should be aware that listening too closely to lead users can also lead to unnecessary pivots if the product vision is too radical in nature.

2.5. How to Utilize Customers Effectively in NPD

With academic evidence strongly indicating that customer involvement indeed is a value-adding practice in NPD and a useful tool for companies, the question then arises: *How* can companies utilize customers in order to enhance NPD performance? Neale and Corkindale (1998) examined in their Long Range Planning Journal article previous research studies showing that co-developing products with customers is a useful practice, as the experience customers have with concrete prototypes helps companies to define the new product features clearly and early, leading to more desirable products and a quicker time to market. However, Neale and Corkindale highlighted that a key research gap exists in customer development research: There are few studies researching the methods and mechanisms of how companies should use customers in NPD (ibid, 1998).

Luckily it turns out that since the Neale and Corkindale article, the topic of customer development and more specifically the problem of how companies should involve customers in NPD process has received more academic attention. Next, in the following sections this thesis reviews various academically supported methods of involving customers in NPD and how they contribute to new product performance.

Coviello and Joseph (2012) acknowledge in their research paper that customer involvement in NPD has long been recognized as a high value-adding activity, but point out that existing literature fails to address comprehensively how customers participate in NPD. Coviello and Joseph examined in their study a group of information and communication technology startups developing major innovations and how these companies managed their NPD processes. The sample was chosen so that 50% of the companies succeeded in their major innovation and 50% experienced a failure with their innovative product in terms of commercial success, with other factors such as NPD experience and company size and age varied, but chosen so that both groups would be comparable with each other and make the results of the study more robust.

Coviello and Joseph (2012) recognized five different NPD activities where customers were involved:

- Opportunity recognition

- Customer-based funding

- Development and testing

- Wider commercialization and

- Ongoing feedback

The authors found that successful firms utilized customers in all NPD activities in an overlapping and iterative fashion, whereas unsuccessful firms approached the NPD process sequentially with customers. Next, by reviewing how customers were utilized in NPD the authors sought to understand what processes lead to higher NPD success. The analysis consisted of the five different customer roles Coviello and Joseph (2012) defined in their research study.

Coviello and Joseph found that both successful and failing products utilized customers for opportunity recognition to understand what features customers would need in the new product. However, whereas failing firms took customer input in this phase only when customers had requests of a different version of the product, the successful firms observed actual usage patterns to understand and discover latent needs that are difficult to vocalize and define. In addition, for succeeding firms the observation of customer behavior was an ongoing continuous process instead of a one-time event in NPD. The succeeding firms also actively sought feedback and criticism for their product throughout the development, whereas the failing firms did ask for feedback during the opportunity recognition phase for their idea, but did not give prototypes for customers to get feedback from actual usage. Instead, the failing firms relied mostly on in-house development and opinions from experts and from NPD team members when developing the product (ibid, 2012).

Another thing that separated successful innovations from failures in the research by Coviello and Joseph was the act of making early sales to customers during the early development phase before the product was even ready. Failing firms did not do any early sales to fund their R&D with customers. Ries (2011) and Maurya (2012) also advocated making early sales with customers during early development as it effectively allows the developing company to test out whether their unique value proposition is valuable enough for customers. By default, early customers are hesitant to pay up front of a product or service that does not exist yet, but by pushing customers to actually fund the R&D of the product, the developing company is able to find support to their hypothesis that their product has

valuable features that are desired by potential customers. In addition, the companies engaging in customer-based funding decrease their financial risk by receiving early funding from customers to support R&D (ibid, 2011; 2012).

Coviello and Joseph (2012) found that the successful innovations in their study were co-developed closely and iteratively with customers during development and testing phases, whereas the failing firms only did limited testing with customers with little or no co-development activities. The failing firms did more in-house testing instead of testing prototypes with customers. In contrast to the research conducted by Taylor and Woojung (2016), Coviello and Joseph found that the firms that actively involved and co-developed the new product with customers felt they got the product to market faster than they could have without involving the customers. In addition, the succeeding firms benefited from having lead users and customers who were eager to help in co-developing the new product, supporting the earlier research by von Hippel (1986) who argues that lead users benefit NPD. The failing firms in the sample did not utilize lead users in NPD, suggesting that there is some correlation between lead users and NPD success (ibid, 2012).

Another benefit of co-developing products with customers that Coviello and Joseph found in their research was that due to co-developing innovations with customers throughout the NPD process, after official launch the customers were much more likely to provide testimonials that in turn helped to increase the legitimacy of the new product in the eyes of later customers. Failing firms that lacked a history of co-development with customers found it harder to get customers to promote the product for them or give testimonials (ibid, 2012).

Coviello and Joseph argued that based on the results of their study companies managing new innovations would find co-developing the product with customers beneficial. By comparing the NPD process of successful and failing innovations, the authors reasoned for an iterative process of "mindful trial and error" (ibid, 2012: p.99) where the developing team actively seeks to get feedback from ideas and prototypes in order to generate new ideas and achieve product/market fit faster. The authors highlight that this process is not done in some specific stage of NPD, but rather throughout all the stages related to NPD.

Another research paper by Laage-Hellman, Lind and Perna (2014) also tackled the issue of academia lacking a good understanding of how customers should be utilized in NPD. The authors built a

framework of customer involvement in NPD and applied the framework in their case study company Volvo AB to verify that the framework can be applied in practice. The framework by Laage-Hellman et al. is rooted in understanding the reasons behind customer involvement in NPD, and the authors concluded that customers are mainly used to build up a better understanding of end-customer needs and thus building a better product and assessing market potential, but also to enhance product marketing as for example lead users and early sales during development can be used as references and legitimizing the product for a larger market, supporting the findings by Coviello and Joseph (ibid, 2014; Coviello and Joseph, 2012).

Laage-Hellman et al. (2014) also note the contradicting evidence from earlier research studies regarding the timing of customer utilization in NPD. Some studies argue for starting the co-development with customers early in the ideation phase and involving customers actively throughout the whole NPD process until wider commercialization has been achieved. On the other hand, other studies argue that involving customers during product development phase is problematic and might even cause problems that lower the success rate of the new product. According to these studies customer involvement is optimally done in the early conceptualization phase and in the later stages close to wider commercialization (ibid, 2014; Callahan and Lasry, 2004; Taylor and Woojung, 2016).

When studying Volvo in their study, Laage-Hellman et al. (2014) noticed that Volvo utilizes both key customers, but also end-users randomly mainly during the early conceptualization phase and at later stages where the product is ready to be pushed into the wider market. The methods for customer participation is similar in early and later stages, where Volvo invites customers or potential customers to fill out surveys and to participate in driving clinics and field tests of the products. The purpose in the earlier stages is to guide the direction of development, whereas the later stages are used to confirm that the product and features are pleasing to customers. In the case of Volvo, the later stage customer participation usually leads only to smaller changes in some feature details, but sometimes they lead to a larger pivot due to a gap between what the developing team thought the logic or usage of some feature would be and how the end-users perceive the feature (ibid, 2014).

In general, the study by Laage-Hellman et al. (2014) supports the notion of involving customers continuously during product development and the case study shows that a broad customer involvement indeed changes the direction of NPD and guides the developing team in terms of filtering new ideas, as it enables the team to gain feedback on prototypes or almost commercially ready products and to make

occasional larger changes to the product. The research paper adds to academia by offering another viewpoint to the customer involvement in the NPD process, as the case study focuses on a company that makes incremental changes to existing products. The study offers some evidence of how larger companies can manage NPD and what benefits customers can provide in the process (ibid, 2014).

Graner and Mißler-Behr (2015) took a wider scope to study what are the most frequently used NPD methods and contribute the most to the success of a new product. Unlike many other NPD studies focusing on in-depth case studies, Graner and Mißler-Behr wanted to have a large sample size (n > 100), representative of a multitude of different manufacturing firms of various sizes in order to test for robustness, and allow for more valid conclusions compared to studies that draw conclusions from individual case studies with a limited number of companies from a specific field. In total, the authors examined 410 NPD projects in their study, including both successful and failing NPD projects.

The authors recognized that market research methods on aggregate contributed the most to NPD success. The most frequently used market research methods were customer interviews, customer observation and product design tests. These were also the most thoroughly and consistently used methods in their large sample (ibid, 2015). These methods were found to be more frequently used in the latter stages of NPD process, especially during prototype development phase before the wider commercialization. The authors argue this is because market research methods "enable product development to be aligned with specific customer needs" and "Where appropriate, they can also avoid the development of product functions that the customer does not perceive or appreciate" (ibid, 2015: p.23-24).

Lynn et al. (1996) suggest using low cost probes in order to understand customer needs by learning from actual product or service usage. The usage patterns are analyzed, and then the newly learned information is used in order to build the next probe, or next version of the new product. By building on previously learned information the company can step by step reduce the uncertainties regarding customer needs. Lynn et al. (1996) emphasize that the main goal for companies doing NPD is to not find out

> *"...what is the right product, but rather, what steps can we take that will generate maximum information about the product and market and how do we incorporate that information into our*

product development. The logic is not to strive to get "it" right, but to strive to maximize learning." - (p. 28)

The authors also highlight that this probing process is not just doing random trial and error, but rather a scientific process of designing experiments that maximize learning in a context that is strategically relevant for the product (ibid, 1996).

Haapasalo and Suikki (2006) take further the notion of involving customers in NPD and argue that the main benefit from involving customers is through piloting continuously by a probe and learn process, supporting the conclusions drawn by Lynn et al. in their 1996 research paper. Haapasalo and Suikki (2006) conducted a three-year study on Nokia to see how they use prototyping in NPD and how it contributes to the success of new innovations. The authors recognized three main categories on the type of feedback sought and received from customers: defects, change requests to requirements and enhancement ideas for future products. In addition, reliability and usability were evaluated. The iterative probing process then leads to analysis and changes to the product, and iterations were made until the customer was happy enough not to make any requests for the product (ibid, 2006).

In the case of Nokia, Haapasalo and Suikki (2006) found that most of the feedback from users during the probing process during the early prototyping to pre-commercialization phases were enhancement ideas, pointing out that the probe and learn process mostly contributes in other ways than being merely a way to test for bugs. However, error feedback was also an important part of customer testing and together they and enhancement ideas contributed to about 90% of product feedback.

But was this feedback useful or just random noise for the developing team? The authors found that 70%-87% of the time customer feedback led to changes in product development during the first two phases, and interestingly the second prototyping phase saw an increase from 15% to 35% where the NPD team took action on product enhancement ideas compared to the first piloting phase. Importantly, in the last pre-commercialization phase the customers specified the product, proving in the case sample that prototyping can have a large impact in what the final product looks like. Citing Haapasalo and Suikki (2006: p.226):

"The genius of customer involvement lays in the fact that the developer might not even think some feature that is valuable to the customer (or has not been specified in requirements), and based on piloting feedback this feature can been [sic] included as an enhancement to the product."

The authors continue that the real benefit of prototyping and involving customers continuously in NPD is "in confirming the common understanding of the requirements - what should be actually delivered" (ibid, 2006: p.227). The common understanding of product requirements between the developing team and customers of product requirements is vital, and therefore prototyping did have a major business impact in the Nokia case, as it enabled the company to adjust to customer needs instead of building a product with specs that were formulated in the very beginning of NPD. With new ventures, these original specs are prone to high uncertainty as customers do not have experience with the product and are unable to properly vocalize what the requirements should be, and thus the first product specification can be very different from the actual product specifications for the finalized product that is ready to be commercialized. In fact, Haapasalo and Suikki found that during the pilots at Nokia a significant amount of change requests were made to features the customers had originally requested in earlier phases. In addition, Nokia did find the prototyping as a useful mechanism for marketing purposes and actually even sold significant amounts of the B2B product already during development (ibid, 2006).

Lastly, Haapasalo and Suikki (2006) note that previous research has placed less emphasis on the analysis of data and feedback from probing and learning process, but argue this is very important aspect of the whole process in order for the developing team to avoid being led to wrong conclusions.

Another study investigating customer involvement and its effect on NPD success was conducted by Chien and Chen in 2010. The authors conducted a multi-faceted study to test how cross-functional integration and involving customers and suppliers affects NPD success. The authors hypothesized that actively involving customers has a positive effect on NPD success because this reduces external uncertainties, such as market demand and changing customer preferences. In addition, the authors argued that active supplier involvement has a similar effect on NPD success, as it enables companies to reduce internal uncertainties in the production process and adapt faster to changes in the product. Lastly, cross-functional integration, for example between marketing and R&D, is thought to make

companies more agile and improve NPD performance (ibid, 2010). Especially the first and last hypotheses are heavily supported by lean startup advocates (Ries, 2011; Maurya, 2012; Blank, 2005).

The authors were able to conclude in their regression analysis study that as multiple other studies have indicated, customer involvement and cross-functional integration had a statistically significant positive correlation with NPD success. In addition, supplier involvement was found to improve NPD process performance, but did not have a significant effect on NPD financial performance (ibid, 2010).

To conclude, previous research shows involving customers in NPD is beneficial as it allows companies to test with real data and feedback what type of product to build and use the feedback as a way to modify product features so that the ready to be commercialized product would be as close to product-market fit as possible. Multiple studies also argued that active customer involvement frequently during NPD allows for more corporate agility, as it allows companies to adjust their product and business model with the latest information by studying and discussing with customers (Callahan and Lasry, 2004; Chien and Chen, 2010; Ciccantelli and Magidson, 1993; Coviello and Joseph, 2012; Laage-Hellman, Lind and Perna, 2014; Neale and Corkindale, 1998; Taylor and Woojung, 2016; Thomke and von Hippel, 2002; von Hippel, 1986).

This conclusion is relevant for examining the research questions in this thesis, as it indicates that customer involvement can either reduce the need for pivots due to the ability to avoiding negative surprises with a higher probability. If a company commits a large amount of resources upfront to a certain business model, the lack of customer utilization during NPD leads to a higher risk of ending up with disappointing market reception and sales revenue. Also, on the other hand it is possible that high customer involvement actually encourages companies to make pivots, as they get timely information regarding customer reception already during development and early market stages that allows the company to change key elements of their business model to better suit the markets if necessary.

The next chapter builds on previous chapters and what is learned of so-called best practices in NPD. Next, we will take a closer look on what is currently known about organizational learning and how this probing and learning process with customer involvement in NPD can be applied by companies in practice.

2.6. Probing and Learning from Failures in NPD

In an interesting research study, Khanna, Guler and Nerkar (2016) found a connection between R&D performance and experimental NPD process of doing systematic trial-and-error and using these small failures for learning. The authors studied voluntary patent expirations from pharmaceutical companies as proxies for past failures to see how these past failures affect the future quality and quantity of newer patents. The authors hypothesized that companies that experience small failures often should learn from these failures, which in turn should lead to improvements in their future R&D performance. Khanna et al. (2016: p.438) nicely sum up in their study the benefits of failures and how they contribute to organizational learning:

> *"Failures may lead to process improvements, increase reliability, reduce rates of future failure, and decrease failure-related costs (Baum and Dahlin, 2007; Haunschild and Sullivan, 2002; Kim and Miner, 2007; Madsen and Desai, 2010). They enhance learning by challenging the understanding of the cause-and-effect relationships, helping firms replace existing routines and knowledge with more useful and accurate ones (e.g., Haunschild and Sullivan, 2002; Henderson and Stern, 2004; March, Sproull, and Tamuz, 1991)."*

In addition, the authors continue (ibid, 2016: p.438) that:

> *"Moreover, failures may change the scope and direction of the organization's search activities. Success leads decision makers to remain on the same trajectory (Audia, Locke, and Smith, 2000), restricting the breadth of search to the neighborhood of existing knowledge (March, 1981). In contrast, failure to reach aspiration levels may trigger problemistic search, causing firms to look for solutions or alternatives that can address the problem of decreased performance (Cyert and March, 1963; Greve, 2003). Failures may also provide firms with information to focus search in new directions (Wildavsky, 1988)."*

Khanna et al. (2016) argue that probing and learning from small failures is a prudent process as small failures do not put the developing company at a great risk of bankruptcy, in contrast to large-scale failures on key products. In addition, the process of probing in NPD suggests companies are mindfully and systematically testing out their hypotheses regarding a wide variety of key aspects of the product, and this increases the chances of learning from any failures these probes may experience. However, the authors do state that large and important failures are more likely to generate organizational learning as they are more likely to lead to a deeper analysis of what went wrong due to importance of the project and the managerial attention it receives (ibid, 2016).

Surprisingly and contrary to the authors' hypothesis, the results of their study suggest that a larger amount of small failures do not lead to higher quantities of future R&D patents. Instead, the correlation between the amount of small failures and R&D output quantity is negative and significant. On the other hand, the results did show statistical significance of R&D quality being correlated with the amount of small failures in the past. The results also supported the hypothesis that R&D quality increases with the number of small failures that were experienced earlier (patents expiring after four years) compared to small failures that were experienced later (patents expiring after 12 years). The small failures that were experienced or accepted after more than ten years were thought be the authors to have less impact on future R&D quality because these failures were not so much in recent memory and key learnings were more likely to be lost (ibid, 2016).

The authors argue the contradicting results are due to the fact that in pharmaceutical firms the continuation or discontinuation decisions of patents are done by IP officers, whereas the actual patent output is coming from scientists. As the IP officers have a good overall picture of the company's patent portfolio and R&D efforts, they can directly influence future R&D output quality with their decisions and by giving feedback to scientists. However, the scientists are slower to process this feedback, and if their efforts are reallocated to other projects it likely results in lower quantity of patents in the future (ibid, 2016). Interestingly, the authors also note that earlier small failures do not lead to lower amount of future small failures, indicating that the small failures are not used to improve reliability of processes but mainly for exploratory purposes instead (ibid, 2016).

Other studies have been published recently that seek to better understand the conditions that enable companies to learn from failures and prototyping. Mueller and Shepherd (2016) hypothesize in their research study that past failure experiences positively correlate with increased use of conscious

structural alignment processes, where the developing team connects market attributes with the capabilities of an NPD solution to help the developing team in identifying new business opportunities. The authors lean on earlier studies indicating that business failures tend to cause a conscious effort for the developing team to understand causalities and especially what went wrong and how they can use this information to develop products in the future that will be successful in the market.

Mueller and Shepherd (2016) went on to study a sample of 114 entrepreneurs that have founded companies in the high-tech industry, and how these entrepreneurs identify business opportunities. Even though the results of the study showed a positive relationship between past failures and increased use of structural alignment processes in opportunity identification, the result was statistically nonsignificant and thus this hypothesis was not supported in Mueller's and Shepherds findings. However, the authors did find a significant and positive correlation between past failures and the entrepreneurs' expertise and knowledge of the market that together form a richer cognitive ability to mirror new information with previous expertise, helping entrepreneurs to see patterns that help them to spot business opportunities (ibid, 2016). In addition, the study found that those entrepreneurs who rely more on past experience and professional knowledge to develop new products benefit less from past failures, suggesting past experience and failures work as substitutes for one another where entrepreneurs with vast experience have already formed cognitive preferences of how to find new opportunities in a given industry (ibid, 2016).

The implication here is that failure experiences can be highly beneficial given that the entrepreneurs or developing team has a high cognitive ability to detect patterns relating to business opportunity recognition. However, the failure experiences themselves do not encourage entrepreneurs to more often implement prototyping and other cognitive tools for opportunity creation. Thus, past failures are not automatically beneficial for entrepreneurs if the entrepreneurs lack the experience that allows them to understand attributes that correlate with successful ventures and to spot new opportunities (ibid, 2016).

Corbett, Neck and DeTienne showed in their 2007 paper titled "How Corporate Entrepreneurs Learn from Fledgling Innovation Initiatives: Cognition and the Development of a Termination Script" that corporate learning from failures is also dependent on how a project is terminated. Corbett et al. studied 11 leading companies from various industries and how these companies terminated and managed new ventures. In their study, the authors were able to identify three different project termination scripts: undisciplined project termination, strategic project termination and innovation drift.

Corbett et al. (2007) found that organizational learning is limited when a project is terminated in undisciplined fashion. Undisciplined project termination script is characterized by a quick decision to terminate the project, and the authors found this to be due to little patience from top management if the projects were seen to have limited potential. When projects are short-lived, there is a limited amount of experimentation involved in NPD, which increases the risk of missing potentially large opportunities and inability to capture learning from the project. In undisciplined project termination learning from failed projects was not emphasized in the study sample – instead the key was to quickly move from unsuccessful projects to new ones. In these instances, it was also common for NPD teams to have inappropriate metrics to measure the performance of the project (ibid, 2007).

Another inefficient way to learn from failures was the common problem of innovation drift, where projects tend to drift for a prolonged period of time even when the potential of the new product is known to not be promising. Managers and developing team might get emotionally involved with their projects and killing projects can turn out to be difficult due to team members experiencing fear over the future of their careers, or if the project has gained significant funding where the sunk costs encourage the developing team to keep on trying to make the project work. Corbett et al. found that when NPD suffers from innovation drift, organizational learning from the project failure is limited. Just as for undisciplined project termination, one symptom of innovation drift seems to be the lack of objective measurements of NPD progress, making it easier for companies to keep on working projects that lack clear milestones. Also, as these projects developed they often drifted to become more separated from the company's general strategic direction and thus top management support and attention started to decrease over time (ibid, 2007).

On the other hand, a strategic termination of a project maximized learning from failures on company level as the NPD process was set up to reflect on what went wrong in order to fare better in future projects. Corbett et al. (2007) found that the key element in strategic project termination was to have specifically formulated milestones to track progress and to early on understand what happens if milestones are not met. This led to objective, data-based termination of projects even though projects might be terminated quickly for a variety of reasons. Croll and Yoskovitz (2013) support this finding, stating in their book that it is critical for NPD teams to set milestones and to benchmark with competitors to understand how high the progress bar should be set. Croll and Yoskovitz explained this

process is critical because it allows NPD teams to understand faster when it is time to pivot or keep on current course.

In their research study, Corbett et al. (2007) examined not only the correlation between organizational learning and the way an NPD project is terminated, but also what type of learning do organizations gain during the NPD process. The authors found that companies learn both during the NPD process, but also after a project is terminated. During the NPD process companies basically learn by doing, as the company clears the fog of uncertainties related to new innovative products where there are more unknowns than knowns at the start of the project. In addition, companies learn how to manage resources more effectively during NPD, and other business units can benefit from the work done by the NPD team by gaining new technical or market knowledge that is discovered during NPD. Lastly, often even failed NPD projects do generate successful smaller innovations that are usable in other parts of the company's business or future NPD projects (ibid, 2007).

Learning from projects post-termination was also common, and interestingly Corbett et al. found that it was common for companies to feel that they were too far removed from their market and end customers, learning that developing products closely with customers throughout the NPD process is very important. Additionally, failing projects contributed to learning about technology, markets, customers and also of skill or competency gaps that the developing team had to succeed in the new product (ibid, 2007).

However, Corbett et al. (2007) found that according to their study the more a company relies on real-time learning during the NPD process, the more likely it is that the company is going to learn from project failures. Those companies that rely more on post-failure learning were less likely to learn effectively from failure due to the long time period after shutting down the project and the post-reflections where companies are more likely to have lost valuable lessons. This is due to short memories if the developing team only reflects what was learned from the project after the failure. Also, innovation drift was found to be more common when the company aimed to rely on post-failure learning. However, in their study Corbett et al. found that post-failure learning was much more common than real-time learning during NPD (ibid, 2007).

Corbett et al. suggest that in order to maximize learning from failing projects, NPD teams should not rush into making pivots or project terminations before understanding and having clear reasons why the

project should be terminated. The authors also highlight that it is detrimental for learning and company's resources to have NPD projects to linger for too long. To combat these issues, the authors suggest working closely with customers and understanding from a wide perspective both market and technology factors that affect NPD performance. It is also imperative that by formulating clear goals and having relevant metrics to measure, the NPD teams should aim to learn actively and consciously during the NPD process in order to maximize learning in real-time, and not just reflect on failed projects post-performance. The authors conclude that as failure is an inevitable part of NPD process, companies should embrace it and aim to learn as much as possible from failures to succeed in the future and develop dynamic competencies for the firm (ibid, 2007).

Building on the earlier research by Corbett et al. (2007), Shepherd, Patzelt, Williams and Warnecke (2014) had an interesting take about NPD project terminations and how learning from failure is affected by the speed of project termination. By studying the R&D efforts of a large, R&D intensive multinational corporation, the authors found that a fast termination of NPD project is less likely to help the developing team members to learn from the failure, whereas a longer termination process allows the team members to have time to reflect on the failed project and the reasons why it failed. In their study, the authors found that the slow process of termination, where it was known that the project termination is highly likely but definitive decisions to terminate the project are missing for a long period of time, led to negative emotions within the NPD team.

In their theoretical framework, Shepherd et al. (2014) examined prior research studies that bring up various ways that negative emotions hinder the ability to learn from failure. However, Shepherd et al. found in their own study that a slow termination project termination process together with the resulting negative emotions are beneficial for learning instead, contradicting prior studies examining innovation drift and its effects on learning (Corbett et al., 2007). Shepherd et al. (2014) noted that in their study sample in the case of slow project termination process where it was obvious that the project would be terminated at some point, the engineers within the projects spent time during the delay to reflect on why the project is failing, and discussed these issues within the team. In contrast, the fast project terminations led to fast redeployment of NPD team members where they could quickly forget about the terminated project and move on to the next challenge without reflecting on the failed project and making any real effort to learn from that failure (ibid, 2014).

It can be interpreted from the study by Shepherd et al. (2014) that agile companies doing NPD should focus on learning from failure during the NPD and not count on learning after the project is terminated or the team makes a large-scale pivot. Even if a slow project termination process is beneficial for learning, it is not optimal use of resources for the company to have employees working on a project that is going to be terminated. Nevertheless, Shepherd et al. (2014) contribute to existing research by showing that learning from failure indeed is not automatic within organizations, and evidence shows that structures and processes should be set to enable learning during NPD.

So far, we have examined existing research highlighting that organizations can and should utilize failure during NPD as a way to learn and to increase the probability of success in the future (Corbett, Neck and DeTienne, 2007; Khanna, Guler and Nerkar, 2016). Also, we have examined various methods, such as actively involving customers and using low cost probes that enable NPD teams to find out issues about the new product faster and thus improving the product by fixing these issues (Callahan and Lasry, 2004; Ciccantelli and Magidson, 1993; Coviello and Joseph, 2012; Laage-Hellman, Lind and Perna, 2014; Neale and Corkindale, 1998; Taylor and Woojung, 2016; Thomke and von Hippel, 2002; von Hippel, 1986). Sometimes the new knowledge learned from failures during the NPD process lead to the realization that the product's features or the business model behind it is destined for failure, leading to the termination of the project, or more commonly a pivot where the developing team decides to make radical changes to the product in order to try and find a sustainable business model around it (Ries, 2011; Maurya, 2012). However, as George Vukotich (2016) explains in his article "Why Failing Fast is Good for Business", pivoting is very difficult for the simple reason that "failure is not always easy to quantify" (p.27). Supporting the research by Corbett et al. (2007) and ideas presented by Coviello and Joseph (2012), Ries (2011) and Blank (2005), Vukotich recommends that companies use milestones to understand what metrics to use and what should be set as goals, and then proceed to measuring product usage and NPD process on a frequent, such as on a daily or weekly basis, in order to be able to make strategic decisions and pivots faster if needed to.

2.7. Stepwise NPD Process – Tying It All Together

To conclude our theoretical framework presented in this paper, the key findings and ideas are summarized and presented as a reminder to aid in reviewing the empirical research section in this study and how the dots are connected between theory and actual new venture management.

In the theoretical framework, empirical evidence was reviewed with many research studies supporting the hypothesis by Eric Ries (2011) and Steve Blank (2005) that one of the core issues of new products and services is to make them desirable to end customers. A lack of sufficient customer interest, sustainable business model or a too long search for one of those two is one of the most common reasons for new venture failures (Berends, Jelinek, Reymen and Stultiëns, 2014; Teece, 1998; Startup Genome, 2012; Griffith, 2014: Vukotich, 2016). The issues are highly accentuated in small companies that often depend on a single product or service. Empirical evidence shows that due to lack of resources, small companies combat this issue by taking a risk control approach where the company develops new projects step by step and avoids committing large amount of resources on pre-made plans and goals that risk a high burn rate that so commonly remain as one of the main causes for startup failures (ibid). This approach was also seen to be common for experienced and successful entrepreneurs in general, suggesting that the approach is linked with entrepreneurial success (Read, Dew, Sarasvathy, Song and Wiltbank, 2009).

A stepwise approach to NPD requires the developing team to not commit to preconceived ideas of what should work, but encourages the team to empirically test their ideas instead. This is done by reexamining the project at each step and by using newly learned and the timeliest information available to decide what the next steps are, and whether the team should adjust their original plans in light of any new information. In some instances, the new information indicates to the developing team that the current strategy is not working now or in the conceivable future, and the company needs to pivot with their product or business model. The aim is at all times to test your value hypotheses and validate them in order to find paying customers for your product. Finding this product/market fit may take many iterations, but in the end the product or service becomes scalable only after paying customers and a sustainable business model is found (Blank, 2005; Ries, 2011).

Empirical studies support the ideas presented by Blank (2005) and Ries (2011), arguing that trial-and-error learning and experimentation promote corporate learning and agility, and improve the long-term

success of new ventures (Ott, Eisenhardt and Bingham, 2017; Bingham and Davis, 2012; Andries, DeBackere and van Looy, 2013). These studies found that companies who we working under a strong effectual logic basis with a willingness and openness to learn at all times, utilizing multiple simultaneous learning processes and experiments, fared better in the long-term in comparison to companies with limited simultaneous learning processes in place. Bingham and Davis suggested behavioral biases, such as overconfidence, also play a role in why some companies perform better in the long-term and adapt more learning processes in their NPD and decision making processes.

The studies show robust learning processes that allow for trial-and-error learning that focus in real-time learning lead companies to make directional changes in NPD more quickly in a stepwise development process that actively uses mindful experiments to guide the process. Companies that have a few learning processes in place face a larger risk of coming to a dead end when their business model has disappointing performance, and therefore are led to distant search pivots when trying to right the course of the company (Andries et al., 2013; Bingham and Davis, 2012).

Blank (2005), Ries (2011) and Maurya (2012) explain that in order to make educated and sound decisions regarding what direction to develop the new product and who it should be sold to, the companies doing NPD need data – and this data should come by studying the customers instead of relying on pre-market research. Empirical data shows that utilizing customers during NPD is beneficial not only to high-tech software firms, but is useful in all areas of business and thus is a key process for any type of firm developing new products (Taylor and Woojung, 2016).

The empirical studies covered in this paper suggest companies are likely to benefit from finding out lead users for their products that find the existing value proposition of the new product most valuable to help in developing the product further. Lead users help the companies to understand the target market better, and thus data input from them in the form of discussions and usage data through prototypes should be utilized to get on the right track in NPD (Gupta and Wilemon, 1990; von Hippel, 1986; Urban and von Hippel, 1988). However, the developing company should also be wary of the problems when listening too carefully to customer feedback, as they can sometimes lead to premature decisions regarding strategy and possible pivots (Lynn, Morone and Paulson, 1996).

Many studies also suggest that companies would be wise to utilize prototyping during NPD to find latent needs from the customers and lead users (Ciccantelli and Magidson, 1993; Anderson and Crocca,

1993; Thomke and von Hippel, 2002). However, especially in the initial stages with lead users and later during pre-commercialization, qualitative customer interviews are also important processes to guide the NPD in addition to customer observation and product design tests (Coviello and Joseph, 2012; Graner and Mißler-Behr, 2015; Haapasalo and Suikki, 2006).

Lastly, we found some varying studies suggesting either to utilize customers iteratively throughout the whole NPD process and all of its different stages to succeed in NPD (Coviello and Joseph, 2012; Haapasalo and Suikki, 2006), whereas some studies suggest that customer development is useful in NPD only at the idea generation and pre-commercialization phase, but is less important or might even hinder progress during development due to slower time to market (Callahan and Lasry, 2004; Taylor and Woojung, 2016). Haapasalo and Suikki (2006) also warn about listening to customers too much during the development phase, as this can lead to unnecessarily increasing product feature list and increasing time to market and ultimately NPD performance. Understanding the possible hindrances customers can cause to NPD during development phase, companies should start relying more on metrics and less on written or spoken feedback (Maurya, 2012).

Another key element of NPD is the concept of corporate learning from failures. We learnt earlier in this paper that learning from failures enables NPD teams to improve their understanding of causal relationships and thus modify their hypotheses and experiments to better reflect reality. We also learnt that small, frequent failures tend to improve future product quality, suggesting that willingness to experience frequent failures and reflect on them is beneficial for NPD (Khanna, Guler and Nerkar, 2016).

Corbett, Neck and DeTienne (2007) also showed that it is important to reflect on failures and terminate projects strategically instead of terminating them quickly or suffering from innovation drift. Shepherd, Patzelt, Williams and Warnecke (2014) elaborated on termination script research by showing that learning is enhanced with slower termination compared to a quick one, even though the slow termination creates emotional pain for the NPD team. It is possible to hypothesize that the termination script research findings can be applied to single NPD projects where one direction or subsection, such as a specific feature set for target market or specific business model, is considered as a project. Then one could infer from empirical studies that NPD teams should not hurry to make pivots, but take a strategic termination approach that takes more time but allows the team to improve their learning and thus better understand causal relationships.
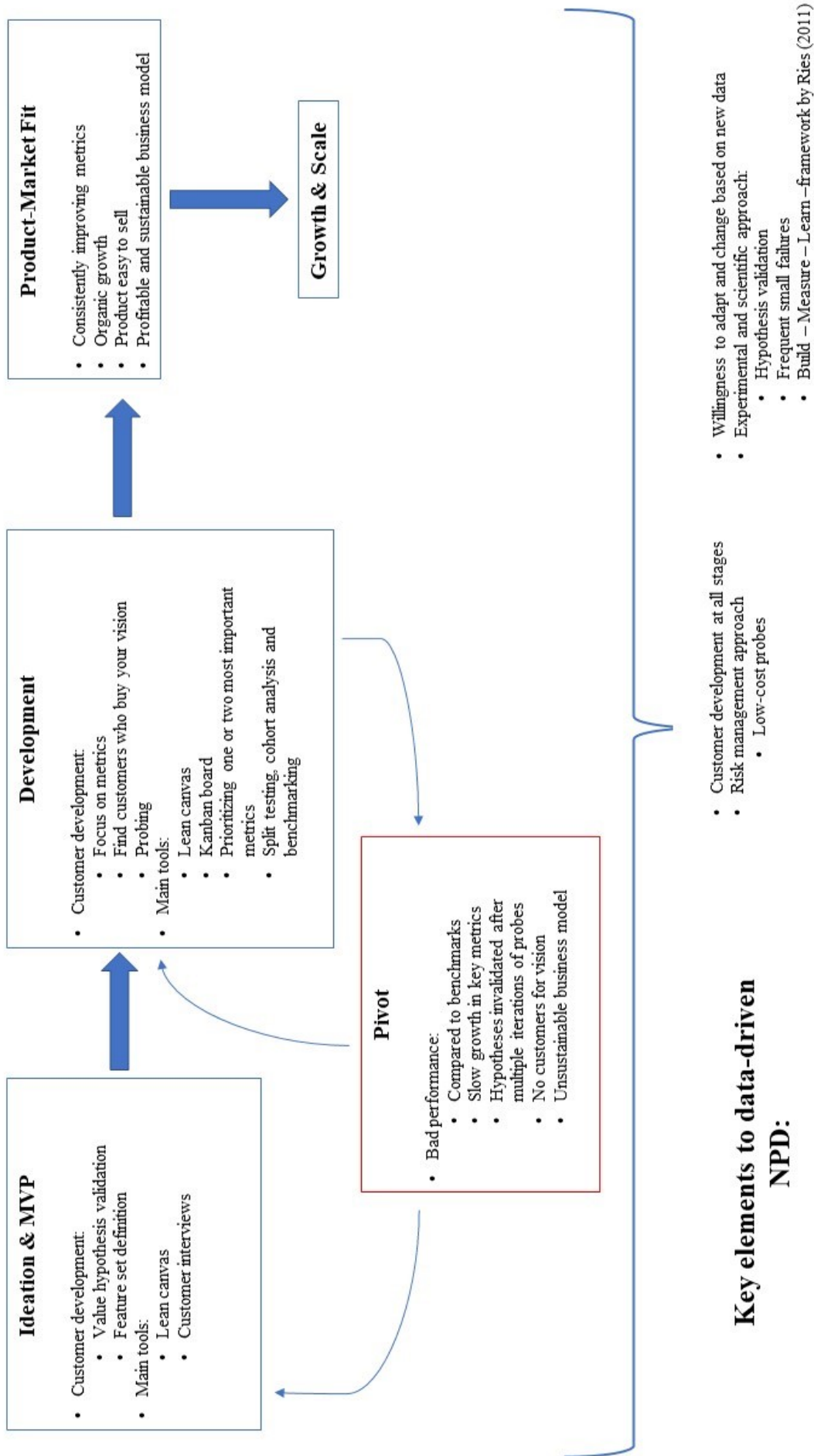
Eric Ries (2011) presented a concrete framework and guidelines for testing out hypotheses and managing the NPD process. The Lean Startup -framework is a continuance of the ideas presented by Blank (2005), and the framework is further detailed by Maurya (2012), who focused on the early stages of NPD to bring out the MVP, and Croll and Yoskovitz (2013), who focus on guiding the data-driven development and scaling process of NPD by presenting an in-depth guide for what type of data different types of businesses should collect and analyze in order to reach product-market fit.

On the following page, the information collected in the literature review is merged to form a coherent and detailed framework of a data-driven NPD process with the attempt to combine empirical evidence and more specific tactics that increase probabilities of commercial success in NPD (Figure 3).

With a rich understanding of how companies can aim to learn from small failures and why customer development is a crucial element in this process and in NPD in general, there still is a research gap when it comes to understanding in more detail what drives companies into pivots, and how they ensure that after the pivot the new business model is the right one to take instead of developing the prior business model further. With studies and Lean Startup –advocates suggesting experimental trial-and-error learning closely with customers allow for swift decision making earlier during NPD, prior studies do not give further insights into how long companies in general should iterate their business model when trying to reach product-market fit, and what are the key factors to be considered when making pivots.

Andries et al. (2013) in their study discuss how companies facing a lack of sales ended up making more distant search that led to pivots, but also discussed that these companies were lingering on their badly performing business models for a somewhat long period of time. However, prior research does not give any detailed insights into why and how companies end up making pivots and how trial-and-error learning affects them.

In order to better understand how companies make pivoting decisions and ensure that the new business model after pivoting is the right path to take, eight companies were interviewed in this thesis study to generate new insights into what are they key factors that drive companies into pivots. Also, the study aims to provide a deeper understanding into how companies choose their business model and what gives them confidence in the future success of their business model.

Figure 3 – NPD Framework 55

Ideation & MVP

- Customer development:
  - Value hypothesis validation
  - Feature set definition
- Main tools:
  - Lean canvas
  - Customer interviews

Development

- Customer development:
  - Focus on metrics
  - Find customers who buy your vision
  - Probing
- Main tools:
  - Lean canvas
  - Kanban board
  - Prioritizing one or two most important metrics
  - Split testing, cohort analysis and benchmarking

Pivot

- Bad performance:
  - Compared to benchmarks
  - Slow growth in key metrics
  - Hypotheses invalidated after multiple iterations of probes
  - No customers for vision
  - Unsustainable business model

Product-Market Fit

- Consistently improving metrics
- Organic growth
- Product easy to sell
- Profitable and sustainable business model

Growth & Scale

Key elements to data-driven NPD:

- Customer development at all stages
- Risk management approach
  - Low-cost probes
- Willingness to adapt and change based on new data
- Experimental and scientific approach:
  - Hypothesis validation
  - Frequent small failures
  - Build – Measure – Learn – framework by Ries (2011)

3. Methodology

This section of the research paper will review the methodology to conduct the research and the reasons why the specific methodology was chosen. The starting point for this research was to firstly conduct a literature review that would support in building in-depth theoretical knowledge on the topic and interesting questions. As argued by Robert Stake, formulating proper research questions is one of the most crucial parts when formulating a case study research (Stake, 1995, 2000 cited in Eriksson and Kovalainen, 2008; Eisenhardt, 1989; Gioia, Corley and Hamilton, 2012).

3.1. The Case Study Method

The chosen method to conduct this research study was to do it via qualitative research methods. Qualitative methods were best suited for seeking answers to the research questions of this study, as they allow for insightful elaboration by the interviewees and help to understand how strategic decisions and product testing is experienced within the case companies.

This exploratory research study aims to fill in the research gaps in NPD literature through in-depth narrative case studies of chosen companies. A case study was chosen as the most appropriate primary research method for studying the stated research questions, as they are best suitable for theory building research (Eisenhardt, 1989). Intensive narrative case studies in our context helps to understand the testing and analysis process for the whole lifecycle of a product, and to discover how companies try to reduce the uncertainties related to new product development when making choices on what strategic direction the company should take. By elaborating on the experiences of interviewees, we can form an understanding of why companies doing NPD end up doing pivots, and what type of information merits the NPD team to make these types of strategic decisions.

Compared to a more extensive case study with a larger sample size, the intensive narrative will give a more in-depth understanding and descriptive account on how companies have applied agile methods in

their product development and strategic decision making in practice. Also, an extensive case study was not appropriate method for the study because of the scope limitations for a master's thesis research. An extensive case study would require a larger sample of case companies with various business models to be able to make generalizations from the sample, and the time allotted for the master's thesis research limits the possibility to conduct this type of research. Without a detailed descriptive narrative of a company's product lifecycle, the insights derived from the research could be limited due to the lack of details and personal experiences of the interviewees. Thus, an intensive narrative case study was chosen as the best medium to find relevant and interesting insights and answers to the research questions at hand. The case studies follow a chronological interview structure to give a clear picture on the product lifecycle, and researchers argue that a chronological structure is well suited for intensive case studies (Yin, 2002 cited in Eriksson and Kovalainen, 2008).

The onto-epistemological starting point for this study is an objectivist approach. With this approach, it is assumed that the interviewees will share their new product development experiences as objective reality instead of subjectively highlighting some certain aspects and leaving other things unmentioned, either on purpose or unconsciously (Eriksson and Kovalainen, 2008). As anonymity was offered up front for the interviewees and the interviews focus more on the historical events of the interviewee company's products, there is little need for the interviewees to hide information or fear about revealing sensitive information regarding the company or its products.

The chosen amount of case companies for this study is eight companies. Eisenhardt (1989) argued in her research paper that for intensive case studies, an appropriate amount would be 4-10 cases, while explaining that with fewer than four cases it can be difficult to generate theory convincingly (Eisenhardt, 1989). The scope of this research fits the scope suggested by Eisenhardt, and with detailed case studies the amount of case companies can be justified for theory building research purposes.

3.2. Sample Selection

In order to find meaningful answers to the research questions, firstly it had to be made sure that the chosen case companies can be generalized as 'agile' and have experience of developing at least one product or service successfully to the market. The reason for choosing agile companies for the sample is that the research is very much tied to the Lean Startup -methodology, which in its core is about agile development of products in terms of learning and strategic decision making. Agile companies are commonly perceived as companies having low amount of bureaucracy, having the ability to make strategic decisions quickly and frequently, and being adaptive to changing market environments.

Also, it was important to select companies with a ready product in the marketplace with preferably at least a couple of years of history, as a startup with no product or service yet in the market would not provide an insightful, longer history of how the development was executed throughout the lifecycle of the product. Even if many products or services can be developed with customers before bringing them into market, the data gathered from limited testing does not provide as many insights compared to a product that has been available in the market for some time and is developed with customer data. Lean Startup -methodology itself suggests bringing products to the market as soon as possible exactly so that companies could learn faster about what works and what does not. This way companies learn directly from their customers and can get access to relevant data quicker compared to developing products from start to finish in-house (Ries, 2011; Maurya, 2012).

Finding companies that explicitly utilize Lean Startup -methodology in their product development can be difficult, as the 'Lean Startup -movement' is only a few years old phenomenon. However, even if a company does not explicitly utilize these management methods or is not necessarily even aware of the Lean Startup -methodology, they can still develop their products through a swift learning process together with other stakeholders in small batches that allows for frequent failures and learning opportunities from those failures. Therefore, for the purposes of the study the aim was to find agile companies that not necessarily explicitly follow the Lean Startup -methodology, but who still do implement various key aspects of it. One key quality of the interviewed companies that was sought for the thesis study was an intensive customer development process that sets the interviewed companies up for a wide variety of data that can be utilized for deciding how to manage the NPD process. This same availability of data would also predispose the companies for surprising information that might cause the

companies to end up making strategic pivots. This way the case companies could be identified as agile organizations with similar characteristics to companies that systematically follow the Lean Startup - methodology in their NPD processes.

As a key part of the Lean Startup -methodology entails learning from failure, it is also very interesting to find out how the case companies cope with failure and manage to change with the needs of the business environment. Interestingly, not all the case companies were obvious success stories and on the contrary, some of them showed significant difficulties in reaching product-market fit. Nevertheless, these less successful companies also showed clear signs of corporate agility and tendency to utilize heavy customer development to understand the markets and what type of product they should build and to whom.

The shared industry sector of the case companies was also considered carefully to provide more insightful information for the purposes of the study; all eight companies were selected from the IT-sector in order to narrow down the scope of the study. A second reason for choosing the companies from the IT-sector was that agile methods are more common in IT, and product development tends to be faster in IT as companies can get access to large amounts of very detailed customer behavior data by using various analytics tools. The surplus of data also again allows for a higher probability of finding surprising information that might cause pivots that are of special interest in this research study.

Also, coding software and reacting on the product test data can be done very quickly compared to products that are not web-based. To give an example of how quickly web-development can be made, Eric Ries recalled in his book that in his 3D-instant messaging startup company IMVU they on average updated and changed the service approximately 50 times a day (Ries, 2011). This speed of changing products is nearly impossible to achieve outside of software and web-based businesses. The extremely fast development process enables companies to learn new things very quickly and react on usage data, thus letting even relatively young startups to be highly experienced with learning through failure and testing processes. As a result, these startups can also be experienced in making multiple important strategic changes in a relatively short period of the company's existence.

Lastly, one factor for choosing the case companies for this study was their fundamental business model. Companies working in the same industry sector with similar products would perhaps give more generalizable results on their product development and strategy making processes within a certain

industry sector. However, a wider variety in terms of the companies' industry segment and business model was desired instead for this study instead. The inspiration for including this factor for company selection can be credited to Croll and Yoskovitz and their book *Lean Analytics: Use Data to Build a Better Startup Faster* (2013), which showed that companies in the IT-sector can have very different business models, and that the specific business model is important for understanding what analytics are important for the company. This also means that companies with different business models are inclined to test different things with their products, and that strategic choices and pivots are made for very different reasons. This way, perhaps a more general model for detecting pivoting reasons and rationalizations can be developed instead of tying the information to a very specific IT-sector and business model.

In their book, Croll and Yoskovitz (2013) identified six main business models for companies working in the IT-sector: E-commerce, software as a service (SaaS), mobile applications, media sites, user-generated content websites and two-sided marketplaces. The eight case companies in this thesis study operate within three different types of business models: SaaS, two-sided marketplaces and mobile applications.

The process for finding companies for the research study generally was done via the following process: Firstly, a selection criterion for fast-growing startups from Finland was that the companies have their product commercialized and have at least a couple of years of history in the market. The search started by browsing through companies that have participated in the annual Slush-event for startups in Helsinki. Slush generally attracts fast-growing startups from the Nordics and Russia for promotional and financing purposes, and the event is considered as the 'largest investor event in Europe' (www.slush.org).

As most important Finnish startups from the past few years have participated the event, it was found as a useful starting point to find out more about the participating companies. In addition, the companies were searched on Google to find additional information on what is written about the companies in the media. The media websites were mostly those of popular national or international newspapers, or media companies that are specifically publishing stories from the technology or IT-sector.

Secondly, after narrowing down the search the aim was to find hints in the media that the selected companies are likely to implement Lean Startup methods in their business. This could manifest itself

with the use of agile website development, learning through failure, customer development and rigorous testing processes. For some of the researched companies, there were mentions in the media about the company's procedures that heavily indicate that parts of the Lean Startup -methodology are indeed used systematically, indicating that these companies likely fit the research purposes.

The eight companies that were eventually selected and interviewed for this thesis study are presented in the table below with their representing business models:

Company	Business model
Blooming.io	Mindfulness and meditation software-hardware solution
Virgo (name changed)	Platform solution for the homecare business
Feedbackly	Platform for collecting customer feedback from various data sources
Futurice	Digitalization and NPD consulting projects as a service
Kiosked	Automated internet marketing solution for providing more relevant and less intrusive ads
Smarp	Employee advocacy platform to improve companies' social media presence
Smartly.io	Automated Facebook advertising solution
Wolt	Mobile application for ordering take-away or home delivery food from restaurants

Except for Wolt which has a B2C product, the other seven companies included in the thesis study have a B2B product or service. Wolt is also the only company operating a two-sided marketplace and mobile application business model, whereas the other businesses are essentially operating under a SaaS model.

However, it should be recognized that the SaaS companies in the study are nevertheless operating in very different types of business sectors. The age and size of the companies in terms of sales and number of employees varies from less than 500 000 euros of sales revenue and 3 founders as sole employees to companies with 30 million euros of revenue and over 200 employees. Most of the companies at the time of interviews during spring 2016 were still not profitable, but were relying on angel investments and venture capital instead to run the day-to-day operations to support product development, the search for product market fit and to fund early growth. However, all of the companies were growing their customer base and revenues at a good pace, some of them even at triple-digit yearly rates, making the study sample of companies interesting case studies as all of them enjoy some level of relevant success.

After having selected the case companies, the next step of the research plan was to analyze which people from inside the company should be selected as interviewees. As the case study type for the research is an intensive narrative case study about the product lifecycle development of the chosen companies, it was imperative to select people who were heavily involved in the product development as interviewees. Therefore, the aim was to interview founders of the companies who are managing the product development process in their respective companies. Founders of the startups would also have a wide perspective on the specific phases of the product development. The only exceptions were Smartly.io, where the interviewee was an early investor instead of being a founding member of the company, and Kiosked where the interviewee joined the company later in a top management position.

3.3. Research Ethics

When preparing to conduct the interviews, informed consent was taken into account to maintain proper research ethics (Eriksson and Kovalainen, 2008). First of all, confidentiality of the research study was offered through the anonymity of the interviewees and the case companies they represented. This was done in order for the selected interviewees to feel more secure about sharing insights in how the products were developed and how it influenced strategic decision making, as some of this information is not necessarily wanted to be shared in public. The interviewees were also told that the master's thesis study itself would be public domain upon completion in order to ensure informed consent.

In addition, it should be disclosed that I am personally not employed by any of the companies in the study sample. In the case of Wolt, I personally know the interviewed founder which did help in getting the interview with the company, but do not otherwise have any other relevant relationships or affiliations with the selected sample companies. I do not have any incentives to edit the experiences of the case companies' interviewees for the study, and I have carefully tried to avoid any preconceived biases or expectations on the companies' experiences by reflecting the information immediately with theory and what are the best practices according to theory. This procedure was taken into account when conducting the interviews in order to not lead the interviewees, as well as in the analysis process when coding the empirical data. By doing this, I as a researcher tried to consciously avoid cognitive biases when processing the research data and for example not leave disconfirming evidence unmentioned in the thesis (Eisenhardt, 1989).

3.4. Data Collection

The data collection was primarily conducted via semi-structured interviews, with open-ended questions exploring how the interviewees were involved in the product development and how the company made strategic decisions and possible pivots during the NPD process. In addition, the interview data was supported by online media coverage on the specific products developed to provide a more complete picture of the product lifecycle and history. The media coverage data also supported the interviews themselves, as it gave a better understanding of the specific product lifecycles and enabled to pinpoint some interesting strategic occurrences that could reveal thought-provoking insights if elaborated by the interviewees. This point was also suggested by Eriksson and Kovalainen (2008) to complement the interviews.

The interviews were designed to be as open-ended as possible in order to encourage the interviewees to tell the product development experiences from their personal point of view. This way, the interviews created an opportunity for any unexpected discovery of additional information and insights from the interviewees compared to answering shorter, more specific questions that would work more for validating existing theories and concepts (Gioia, Corley and Hamilton, 2012). An open-ended structure for the interviews allowed for more flexibility, if any interesting new insights arise during the interviews that motivate further inquiry (Eriksson and Kovalainen, 2008).

The interviewees were first told the purpose and structure of the research, and were then asked to elaborate on the product development lifecycle from their own experience, with specific focus on how they tested the products and how this information was used to make strategic decisions and changes. All interviews had a unifying chronological structure that allows to examine product lifecycle from idea generation to sales growth and wider scale expansion used as a framework for these interviews. The framework is depicted in Appendix 1. The structure for the interviews was based on different NPD phases depicted in empirical and Lean Startup -literature, and aims to guide the interviewees through the important checkpoints of the history of their company's product. The four phases of NPD used in the interview structure were:

1. Ideation phase

   - How the idea for the new product was generated and validated in order for the company to move forward into building the product

2. Minimum viable product (MVP) phase

   - How the company agreed with the feature set of the MVP and what did they learn at this stage regarding the vision they had generated in the ideation phase

3. Product/Market fit (PMF) phase

   - How the company managed their NPD so that they went from MVP to a desirable and scalable product that is growing in the marketplace and can carry the company into the future

4. Growth and scale phase

   - With PMF found, how does the company further manage their NPD and company when they aim to expand their business overseas

Each interviewee was familiarized with the described chronological structure above before and at the beginning of the interviews. By following this structure, the interview flowed naturally through the very different stages in NPD and also allowed for the interviewees to focus on these different stages and any possible strategic changes or pivots that occurred during the history of the product.

The interview flow was aimed to be kept as natural as possible, and the structure allowed for further inquiring questions if any interesting occurrences regarding NPD were brought up during the conversation. This was done in order to allow the interviewee to elaborate on specific occurrences that were of special interest for the research questions. In general however, leading questions were avoided, but the interviewees were guided to openly share their own experience on product development from ideation to commercialization, and further elaborate on any interesting points that came up during the interviews.

In total, eight interviews were conducted for the research study, with one interview averaging 40 minutes in length. Six interviews were conducted face-to-face, and two interviews were done online via Skype. The face-to-face interviews were recorded with a smartphone microphone, and the Skype interviews were recorded with a separate recording software program.

After the interviews, the recordings were then written down verbatim in order to assist the analysis process of the study. The analysis process consisted of coding the empirical data in relation to theory, with a specific focus on understanding how companies resolve risks and uncertainty and make strategic changes and decision during the NPD process. The coding process was conducted by first giving labels to relevant empirical data. In addition to labeling the data, the coding was used to link the data into ideas and to form meanings behind the data (Saldaña, 2013; Gioia, Corley and Hamilton, 2012; Braun and Clarke, 2006).

This first round of coding was then used in order to assist on the second stage of analysis where the labels were mapped out in order to notice any underlying themes or concepts. These maps were done visually with post-it notes which enabled mixing the grouping of data and generate new ideas. This was done to help in managing the large number of codes derived from data and to link the ideas to new concepts (ibid; 2013, 2012, 2006).

This process of coding the empirical data allowed for content and cross-case analysis, which could then be used to analyze any similarities and differences between individual cases (Eriksson and Kovalainen, 2008). Finally, the analyzed data was compared to theory to reflect on the key findings of the research study and how it contributes to existing literature.

After this process, the last step of the study was to write up the report via narrative case stories with a focus on trial-and-error learning, customer development and strategic change. In some instances, quotes were used for story-telling and validity purposes so that the study would be more intriguing and readable (Gioia, Corley and Hamilton, 2012). The validity of the research is an important feat to achieve, and direct quotes together with the coding process help readers to understand how the conclusions of the research were reached with the data. A triangulation of researchers would have further improved the reliability of the research (Eriksson and Kovalainen, 2008), but as the master's thesis is required to be done individually, this triangular method of cross-checking interpretations and conclusions was left out of the study.

4. Findings

4.1. NPD Practices during Early Ideation and MVP Phases

First step in the research study was to understand how the interviewed companies develop their products, how they collect data and decide what type of data is relevant when making strategic decisions regarding NPD. As hoped during the company screening and selection process for the interviews, all the interviewed companies were highly active in customer development processes already during the idea generation phase where they tried to figure out what the customers want and then build a product around this information.

As supported by empirical studies (Callahan and Lasry, 2004; Taylor and Woojung, 2016), all of the interviewed companies were very active in involving customers to validate their business idea and to help in defining the feature set for the MVP. After coming up with initial product ideas and discussing them with family and friends, the interviewed companies quickly started to contact potential customers and discuss their problems to understand what type of features the developing team should build in order to serve customer needs and solve their problems. The mindset and approach clearly appeared to be an effectual one that accepts the fact that the original vision from the developing team is an idea that is the product of many assumptions, and that these assumptions should be tested with real customers first before trusting that the vision would produce a successful product. One of the interviewed companies did not take an immediate customer development approach to NPD, but instead spent a year visioning the product with the goal of gathering venture funding to build the product envisioned. However, this company found out after the year that there was little interest from investors to fund the vision, which in turn led the developing team to "scrap 95% of the vision" and build the MVP in two months to fund the company via sales revenue in place of venture funding.

As suggested by Maurya (2012) in his book, the customer development process during the idea validation phase consisted primarily of discussions and interviews with end users and customers, something that was mentioned and discussed by all the interviewees. The interviewee from Blooming.io elaborated in more detail how this process was done in their company, and discussed that they did hundreds of meetings and phone calls with customers to generate an understanding of what

problems the customers have and what type of product would best serve the average customers to solve the key problems. The interviewee highlighted that it was important to first just ask questions and learn from the interviewed potential customers and only offer the hypothesis, or the potential product to solve customers' issues, after the developing team had inquired about the customers' problems and habits to not bias them beforehand to lean towards the hypothesized solution from the developing team. This was done in order to not bias the potential customers beforehand to lean towards the hypothesized solution from the developing team. This was done for the developing team to form a higher confidence in the relevance of their product hypothesis and its value.

It was common for the interviewed companies to select a few potential first customers and focus on developing the MVP together with these few customers intensively by having active discussions and interviews that shaped the initial features of the MVP. As the interviewee from Virgo explained about their company's approach to building the MVP and validating their business idea:

> *"...And really quickly after the initial ideation phase we understood that we want to do it (product development) really closely with customers. We kind of took it as our first objective after the quick ideation phase that we have to find some company that is willing to develop this together with us."*

The interviewee from Kiosked also shared their similar type of thinking and approach:

> *"... they [our founders] have from the beginning started to validate with customers. It has been central that we have not stayed here to develop, develop and develop and develop and then after two years ask whether anybody would be interested in the product, but we have instead validated from the beginning. And then at the start our founders took a couple of strong developers [customers] with whom we built the MVP, and really started to test the market with an initial product prototype and then later on with the MVP. So we basically jumped into cold water, which really showed us how the product actually works as a whole."*

The idea here seemed to be that by having selected a target segment, a few lead users would help tailor the new product so that it fills all the key needs very well, and then this jointly developed product with a few lead users could then be sold to a larger audience, as shared by one of the interviewees:

"From the beginning our product development philosophy was one where we take one big, demanding customer, build a suitable product for them and then hope that it is a good fit for others as well."

In addition, it was noted by one interviewee that by working closely with a couple of lead users enables the developing company to speed the time to market:

"So sort of an exception to what is usually done where you work with a large amount of companies or customers to validate your idea or to get ideas, hypothesize and then validate the product idea with a really large sample size. Instead, we did it with a quite small audience, more like projects for big customers. That speeded it up [NPD and time to market] quite a lot. Basically we did it so that we were at the customer premises and then one of our founders was coding there and showing the customer every two hours that this is what I've got now."

The other approach for idea validation was to take a larger set of potential customers to see whether the value proposition resonates with customers, with the reasoning being that a larger sample of discussions with potential customers would allow the team to have more certainty in validating or invalidating their ideas with the larger sample size decreasing the chance of getting false signals on what works and what doesn't. The interviewee from Blooming.io shared how they heavily did hypothesis validation with end users, sales channels and other stakeholders with a fairly large sample size to see whether their ideas are worth building. The first product idea from this company actually got invalidated with early discussions with different stakeholders, which led the team to pivot into a different type of product that saw a similar process for idea validation. With hindsight, however, the interviewee reflected that they could have had even larger sample size of interviews to validate the

second product idea as the second product idea got pivoted later on as well. The interviewee from Virgo also reflected with hindsight that they could have avoided some issues with their product offering by having a larger sample size of early interviews with customers instead of focusing only on a couple of key customers with whom to develop the MVP, as their company ended up editing and increasing feature list to the MVP due to the limited understanding of what is required by a larger sample of customers.

The reflections from the interviewees resonate a lot with the research studies by Gupta and Wilemon (1990), von Hippel (1986) and Urban and von Hippel (1988) that showed how lead users can aid companies building new products to understand market better and help in developing the product features so that the developing company is more in tune with customer needs and has a higher likeliness of building a product that will be wanted by the selected market segment. In addition, one interviewee reflected that by focusing on co-developing the product with a few lead user customers they were able to speed up the NPD process and time to market.

However, as some empirical studies argued (Lynn, Morone and Paulson; 1996), developing products with lead users is not without its problems. With a focus on co-developing the MVP with only a few customers, some of the companies explained that a close co-development can lead to an increasing amount of feature demands that might lead the developing team astray when they are trying to build a unified product that is a good fit for a larger customer base. Three out of eight interviewees took note on this issue, and one of them saw the small sample size of lead users as a mistake as the developing team "listened to them (lead users) a bit too much" when trying to come up with MVP feature set. In addition, a focus on a limited set of lead users increased time to market as the company understood they have to make larger editions to the MVP in order to sell it in larger quantities in the market.

There were also some differences between the companies when analyzing how they utilized customers from ideation to MVP. Some of the companies were in close contact with a few key customers throughout the whole MVP building process, and essentially co-developed the product actively with them with discussions. A few of the companies instead attempted to understand customer problems at the ideation phase, formed hypotheses how to solve these problems and the built the MVP and its feature set mostly in-house and presented a ready solution to customers after this closed up development phase.

However, the companies deciding to build the MVP in a more closed environment seemed to spend a lot of time with customer discussions during the ideation phase, giving a sufficiently large sample size and detailed picture to enable the team to figure out with sufficient confidence what type of MVP feature set should serve customer needs. The companies that did not do extensive customer development when building the MVP did not separately express that they had hoped to involve customers more during this phase of NPD, and there were no indications from the interviews that utilizing customers more or less actively during the development phase of the MVP did hinder or improve NPD performance. Thus, the interviews here did not explicitly support research studies by Callahan and Lasry (2004) and Taylor and Woojung (2016) that expressed evidence over a slowed time to market when companies actively listened to customers during product development.

In addition to validating initial product idea with customers through discussions, one of the companies also took the approach of actively validating the initial product idea with investors in addition to customers, reasoning that seasoned startup investors are very knowledgeable about various industries and can with their experience help in identifying new innovative ideas that have the potential of becoming successful products in the market. Another interviewee also had active discussions with a platform provider that potential customers utilized to understand the customers' needs and problems better.

In summary, all the interviewed companies were very active in customer development processes especially during the ideation phase and after having the MVP for sale. All the interviewees discussed how they saw customer development as very important aspect of NPD in order to enhance probabilities of success, and all of the interviewees also shared that they utilize customers a lot now after the product offering is out for sale. However, whereas initially the customer development focused more on discussions and interviewees, other quantitative data points reflecting customer behavior have become increasingly important as the interviewed companies have a larger customer base where to draw data from. Nevertheless, qualitative probing of customer behavior to generate new feature ideas are still seen as important, as supported by Haapasalo and Suikki in their 2006 research paper showing one key benefit of discussing with customers is to generate new feature ideas that otherwise might not have been envisioned by the developing team.

4.2. NPD process: Experiments and Customer Development

Another notable aspect of idea and MVP validation with the interviewed companies was that most of the interviewees emphasized a cost-efficient probe and learn process to test how customers react to product ideas. Most of the interviewed companies described their initial product launch as a beta or alpha version of the envisioned end product, with the purpose of testing whether there is any demand for the product idea. This mindset of using low-cost probes to test out hypotheses was also elaborated further down the NPD process after the initial MVP. For example, the interviewee from Wolt made it very clear that the company had a clear management process in place that necessitates using low-cost probes to cost-efficiently test various hypotheses in the market when testing out new features and aiming to achieve product-market fit. Like with most of our case companies, the MVP itself from Wolt was a low-cost probe designed to test how customers perceive the value proposition and whether they 'get' the innovative idea behind the product. After the MVP, the company did the low-cost testing of new product features and ideas via partnerships with other companies, relieving the interviewed company of larger upfront costs needed to build the foundations and infrastructure necessary to support new product features. Wolt used the partnership approach to experiment when testing out the home-delivery feature for their app, as the company did not want to build a fleet of employees ready to deliver food without knowing what the customer reception would be for the feature.

The interviewee from Wolt shared their company's approach to NPD that has been prevalent from the ideation phase of their product offering:

> *"... And right after the most critical stuff when we have time, we will take our ideas and start building mockups, drawings and all the time try to think what is the most minimal way we can try this thing out and see how others (competitors) have done these things and so on."*

The low-cost probing was not limited to building the MVP with our interviewed case companies, but was thought to be important throughout the whole NPD process when trying to reach PMF. The interviewee from Futurice elaborated on this point and discussed the importance of learning from

failures and using low-cost probes to efficiently test out hypotheses:

> *"And in the first phase we create options in the ideation phase. From there we decide what we are going to experiment in the second phase. Then from this experimentation phase we come back here [to the first phase] or go on to the third phase which is strategy. And the fourth phase is executing that strategy… And then [during this process] you are likely to experience a lot of pivots, probably nine out of ten experiments are going to more or less fail and you have to understand that. With this in mind, the crucial point here is how cheaply and quickly we can create these experiments."*

This mindset of experimenting things in order to learn was an apparent commonality between all of the case companies. Some of the companies, like Wolt and Futurice, clearly vocalized during the interviews the importance of low-cost probing to experiment hypotheses in order to understand which way to develop the product. Interestingly, multiple interviewees reflected how important low-cost probing was for them as these companies made clear pivots due to the ability to experiment new feature ideas in a very lean fashion. For example, the interviewee from Wolt explained how they came to test out the home delivery feature that eventually led to a pivot where the new feature became their core product:

> *"… But one reason why we decided to actually try out that feature was that we decided to try it in a very, very lean fashion."*

Similarly, the interviewee from Kiosked reflected their experience of finding the current direction of the company via a small experiment:

> *"… The pivot we made was a big one, but it also was a small one in the sense that we spent just one weekend to build and execute the pivot. We had so many assets in place that we just thought*

we could try this thing out, whether it could work, so let's just put this here and see how it works."

Also, one of the interviewees discussed on the importance of low-cost probes and experimenting in general and how they can change the direction of the company as experiments can sometimes lead to surprising new information that force the developing team to reconsider what would be the best direction for them and their product:

"Yes and often it goes so that you get an insight from an experiment that you could not even expect, and then it comes back here or into strategy, such as with this one industrial company where they suddenly got an insight that led to a change in their strategy. So the experiment was successful but the insight received from it was completely different than what was initially expected."

A similar mindset was also noticeable from the companies that developed their products very closely with key customers. After validating the MVP, these companies closely listened and studied customers to understand how to develop the feature set of their product offering. For example, the interviewee from Wolt discussed how they focused on developing the product further with a certain set of customers that can be recognized as lead users:

"Maybe one of the best things was that when we found a few guys who really loved our product and told us that this was what they had always wanted, we started to exchange thoughts with them more carefully and also studied their behavior much more. They were the validation we had to find, so we actually started to talk about MLP, or minimum lovable product. So we had to find the feature set that someone thought that this is the thing. So we always had to find someone who thought that this [feature] is the best and at that point we knew that OK, this is a good feature and maybe these others are not. So if someone said that this the reason I use this product, then at that point the feature was validated pretty well."

Other companies also discussed how they develop their products further by having discussions with customers. However, multiple interviewees took note that very quickly you start to get an increasing amount of feature requests as your customer base grows, and then an important aspect of the NPD process is that you have to carefully decide what features you want to include in the product and what not. But even though customers in many instances provided new feature ideas through vocal requests, in many cases new product hypotheses rose more from analyzing customer behavior and figuring things out via brainstorming within the NPD teams more than from direct discussions or requests from customers when you have a larger customer base. With a larger customer base, it became easier for the companies to test new feature reception with quantitative customer data.

Nevertheless, all the interviewed companies clearly stated that they are frequently discussing with customers how to improve their products and thus seemed to utilize customers at all different stages of NPD throughout product lifecycle, with the exception of utilizing customers less during the development phase of building the MVP. The degree of which interviewed companies spent more time with quantitative or qualitative analysis to understand the direction of the NPD depends on the type of company and business model. The companies naturally working with fewer customers tended to rely more on discussions and interviews, and the companies building products to larger customer base made more use of quantitative data to understand the direction of the company. Even though the data collection method for understanding customer behavior and preferences matters as to what type of metrics and developmental milestones to follow, we will find out next that there were still many similarities into how the companies came up with strategic decisions and pivots.

4.3. Learning from Failure: Pivots and the Pursuit of PMF

Out of the interviewed companies there were varying degrees to which the companies had to change their strategic direction and make pivots. Some of the interviewed companies made radical changes to their product offering and business model throughout the history of the company with significant pivoting events, whereas others had smaller scale pivots and changes that guided the NPD process into a product that achieved PMF and allowed the developing company to focus on growing and scaling the business.

Two of the interviewed companies did not have any clear pivots during NPD after generating the initial product idea. According to these interviewees, the companies did not face obvious pivots as they thought that they had reached PMF pretty quickly from the get go. The other one of these companies started off by developing the product and MVP closely with customers as projects, and the plan was to scale the product from there to other customers as well. The interviewee from Smartly.io explained how they reached PMF very quickly at the early stages of the company:

> *"Basically, the fact that customers generally thought our product is faster and more pleasant to use than the platform provider's own tools was one thing that validated the product. But also, a very important thing to validate was whether somebody is willing to pay something for a product with a relatively small feature set with just a few months of development work. And they indeed did pay us, and we still today have our pricing model as a percentage of customers' marketing spend on the platform. This basically means someone using our software can pay us 50 000 euros per month which is a really good business model. As you could basically sell this software for a fixed fee of 30 euros per month, choosing the business model right was definitely a key factor here."*

For this company, the sign of PMF was that they were able to generate a highly profitable business from the get go even with an MVP that initially had a fairly limited feature set, letting the team to very quickly focus on growing the business to other customers and industry sectors as well. Feedbackly's

product was also developed without any clear-cut pivoting situations, and the interviewee also felt that the company reached PMF quickly, and later on extended the scope of the product naturally by including new features after already successfully selling a more focused MVP product.

As Feedbackly did extensive customer development with customers, they noticed by discussing with customers and analyzing end user behavior that adding new features and channels to the product would enhance the product experience both for the end user and the paying customer. These observations led the team to experiment their hypotheses as new features with selected lead user customers, and after positive feedback that validated the new feature they added the new features to the core product offering. In addition, the interviewee noted that one important aspect here was that the company had technical assets in place that allowed them to pretty easily push new features to the existing product without spending a lot of time and resources to test the new hypotheses in the form of additional features.

The other six interviewees described how their company did face clear pivoting decisions throughout the NPD process to varying degrees. The interviewee from Virgo discussed that the largest change in their NPD process came during MVP development in the form of a zoom-out pivot, as they realized that their original MVP product would be too focused and small in terms of features to serve customers well after discussions with customers who were involved in MVP development. The main reason for this misstep during early development was that the company focused on serving end users, but realized that the actual customers who they are selling the product for have additional needs that need to be addressed as well in addition to serving end user needs. Therefore, the developing team understood that they had to diversify and widen their MVP feature set in order to have a functioning MVP that could be sold for customers.

The interviewee went on to give further insights to the events that led the team to make the zoom-out pivot, as they originally did try to sell out the more focused version of the MVP for customers:

> *"We thought and heard from many different sources that communications between our customer companies and end users is a big need and there is currently no existing solution for that. So, we thought that we could sell a solution for that need as a separate service. But then we had to face the realities of the market in a sense as to what kind of a solution the customers*

were willing to buy. So there just was not, or at least we could not find a large enough customer

base that would have been ready to buy the focused solution we wanted to offer."

It seemed that the main reason for the company making a pivot was the inability to sell profitably the product to customers, combined with feedback and discussions with the customers. But in this instance, it seems the most obvious metric that led to the pivot was lack of sufficient sales. This led to a change in the product offering which allowed the company to sell their product to a larger customer base and according to the interviewee led their team to believe they had found a PMF in the local markets as sales and customer reception improved.

The rest of the interviewed companies did also experience significant pivots during their product development history, leading to large changes in the company's underlying business model and product. The interviewee from Smarp explained how they really had two significant pivots over the course of the product lifecycle. The first pivot for the company was considered by the interviewee as a natural development for them. The company originally did B2B consulting services and started pretty early to think how to scale the business globally, an idea that was partly generated from the fact that the team started to get more interest from customers abroad. As physically moving around would be costly and cumbersome for a small startup, the team then got the idea of switching into a SaaS business model where the consulting was transformed into online video coaching to replace the face to face meetings with customers. Even though this first pivot changed the business model for the team quite a lot, the reasoning for the pivot was not result of a negative performance of the original business model but rather a solution to fix the low scalability of the original business model. The company at this stage was still a small one, but was able to generate sufficient revenue to keep the company afloat and with the general value proposition virtually unchanged, the team was able to enjoy a continued interest for the company's services and improved larger revenue growth due to the channel pivot that allowed for better scalability.

After making the pivot with the main focus now in online business, Smarp developed their service offering very closely with customers in order to develop a desirable feature set that could then be scaled to multiple customers. When developing new features and showcasing them to customers, the

team faced an interesting situation that would later on define the future of the company quite substantially:

> *"When we got the new module built into the product it generated interest right away. So for example when we went into a meeting then all of the questions [regarding our product] revolved around the new module. In addition, the sales for our video academy product until then was not as strong as we had wanted, so we had to make a move in that sense. We kind of foresaw that the video academy could never become a such a big thing and there were also other products like that, so we kind of started all over again to build something completely new as the video academy was also easier to copy and so on. So there were many factors that drove us into the pivot."*

The interviewee continued to elaborate that during sales meetings in addition to asking questions about the one single feature of the product, the customers also frequently told their team that they were not interested in the video academy product but wanted to only buy the one new feature as a standalone product instead. At that point the developing team had not even thought about selling the single feature as a standalone product, and therefore had no pricing in mind for it either. The high demand for customers and disinterest for the wider product then led the team to make a zoom-in pivot where they eventually decided to kill the consulting and video academy business altogether, and essentially became a software company with the one stand-alone feature now as the core product sold to customers.

One of the other interviewees shared a similar pivoting experience, showcasing the usefulness of experimenting with low-cost probes. The interviewee from Wolt discussed how they were able to enjoy viral growth quite quickly after the initial MVP with their consumer product, and were thinking how to develop the product further. As the founding team had limited resources, they wanted to focus their resources on specific issues that features would solve. Today we know that the company is mostly known as a restaurant food home delivery application in addition to the takeaway features, but the company's product today could actually be quite different with a different focus, as the team had other plans in mind for their mobile app that initially focused as an easy way to order and pay for takeaway

food at restaurants:

> *"It was a distinct decision there as we have a small team and we had to decide what features we are going to build. We thought another option would be to solve sports stadium problems… so at that point we had to decide that either we are going to get our takeaway food and eat-in market fit from restaurants or for example sports stadiums. I think in that sense we made a clear pivot that instead of going for that type of product to a different market we thought that this home delivery would for sure be a bigger thing and we should pursue that instead. That has been a significant change of direction for us."*

To further elaborate on why the team made the decision to focus on home delivery instead of going after sports stadiums, the interviewee shared that there were two key reasons that led to the new focus:

> *"So Foodora [competitor] entering into the Finnish market was pretty significant as they put up a challenge for us and also as we saw that they are focused only on home deliveries and have been pretty successful with that business model abroad. We then thought that this food home delivery feature must be a crucial part of our product… So we quite clearly decided to try it out. But one key reason why we also decided to try out home deliveries was that we decided to do it very very leanly… So at that point we decided that we are going to try whether this would work in Finland or not and how we would do it. We had thought about it a lot within the team, but we had not prioritized it enough until our competitors kind of forced us to prioritize that."*

However, merely experimenting with a new feature naturally was not a pivot for the company, but rather what happened after running live with the new feature:

> *"So in the end it was really clear then… very quickly after going live with the feature it was clear to us that we have a scaling problem where we just don't have enough capacity. And then we understood that if we do not have enough capacity then we have a positive problem, as we*

could grow bigger but we need more employees. And as at that point we found bottleneck for our growth we were able to validate with confidence that this [home delivery] is something we should really focus on."

The interviewee added that mere market demand and positive customer reception for the new feature was not the sole reason that validated the new focus for the company, but the increased revenue they were able to generate with the new feature:

"So there was a lot of demand. It was exciting as I remember how it was possible to very clearly see that everybody praised the new feature and most importantly, everybody was willing to pay for it."

The common theme around the two main reasons that led Wolt for the pivot was firstly the ability to efficiently test new features via low cost probes, and a surprisingly high market demand driving faster growth and financial validation after going live with the new feature. These two factors enabled the company to quickly decide redirect their focus to the faster growing segment of their business and directing most resources into developing the new feature.

A similar reasoning behind the pivot was noted from the discussions with the interviewee from Kiosked, where the company also tried out a new feature and ended up making a pivot. However, this interviewee elaborated that they came off from a different standpoint where the developing team was not pleased with the performance of the existing product before the pivot. The company had originally built a platform allowing for media websites to link ecommerce layers to their website similar to having advertising layers, with a smart algorithm attempting to make the ecommerce fit into various media website content seamlessly and less intrusively compared to traditional ad banners on the internet. With having the unit implemented to a set of large publisher websites, the firm was able to get fairly large amount of data to see how end users interact with their platform and the publisher content.

The founding team was then able to notice that their product generated a lot of interaction with the end users, but the team had a hard time generating desired actions in the form of purchases and satisfactory revenues from their ecommerce layer:

> *"How the MVP performed in the market was what led to the pivot. When we built our MVP we really pushed it hard to the markets and large markets… We pushed the MVP there and tried to find a way to take our revenue to the level it should be… We probably struggled about nine months with the first model. We tuned it and made it better, fine-tuned the conversions, how many are buying and we managed to increase the conversions with the old model, but then at some point we just saw that we are so far away from where we are supposed to be. So even if we managed to double our conversion rates with this model it still isn't good enough. We had to find something bigger."*

However, even with disappointing conversion rates, the company did also get positive feedback for their product from other stakeholders:

> *"It wasn't like nobody was interested in our product, but instead we had a lot of excitement both from the publishers and also from investors. And we knew that some things worked but some things didn't… We knew that people are exploring the content and looking at the products. We even already considered at that point with the ecommerce project that maybe we should have some form of pricing here as they [end users] are for example looking at these soccer shoes so this adds value to Puma or some other company when the visitors are browsing their shoes."*

After the nine months of trying to improve conversions with the ecommerce MVP, the team decided to try out another approach that was the resultant of the observation that end users were still interacting with their ecommerce product, even though they did not eventually convert and buy the items. As the team struggled with having a viable business model with the ecommerce unit, they decided to try out

having an awareness unit that replaced the ecommerce with advertisements. As the awareness model would be easy to implement utilizing the assets in place made for the ecommerce unit, the team decided to give it a shot and built the awareness unit probe within one weekend.

"When we built it during the weekend and went live with it the next Monday, we could see that it worked. Like the first Monday it started to work immediately. It was interesting that poof, it immediately started to radically scale up… So now we saw that we could finally tick the last checkmark here and can start to fine tune this one. Now we found the model that works. So it was pretty easy to verify that this looks pretty good."

After the experiment with the new model the company was immediately able to see that they should focus on the new business model instead of the old ecommerce one, and the pivot set the new direction for the business for years to come as they were able to multiply their revenues on a yearly basis after adopting the new focus on their business. The key factor according to the interviewee was that with the new business model they were finally able to generate satisfactory revenues and also enjoyed largely improved revenue growth. With improved financials, it was easy for the developing team to understand that they should change their business model from ecommerce to advertisements.

Another interesting case study for the research was Futurice, where the interviewee described how they experienced two different types of significant pivots that had different characteristics in terms of what led to the pivot, but both of the pivots shared similarities with the previously presented case companies in terms of why the pivots were made.

Originally, Futurice had a completely different product and business model compared to their current consulting as a service -business model, and the team originally created their MVP in a short time frame due to the lack of venture funding so they could have a product to sell in order to found the startup. As the founder described, the resultant MVP was positively received in the market:

"If we can't get money from investors then we need something from our customers… and this kind of forced us into a situation where we had to sell something. And we indeed could sell our

MVP, it was great. We sold it to multiple customers in Finland, we sold it in Germany and things looked really good in 2002. And then we sort of had the illusion of having reached product-market fit if you think about the Lean Startup framework and so on. But then what happened in August 2002 was that within two months all of our customers saw our product as not having any real consumer business behind it. So these had just been investments, irrelevant side stuff for them. And then they pulled everything down in August and September 2002. That meant that if in June 2002 we had a small 10 employee company enjoying great profits and feeling that we have everything in place, then three months later we did not have a single customer left."

"So that really invalidated this and what we learned was that if you have this kind of market boom phase, then it does not really validate whether you are doing anything relevant. You can gain some business with complete bogus ideas for a year for example. But when the market turns sour, then you can really validate if you are doing the right thing or the wrong thing. And our first validation was that we were doing the wrong thing. But the great thing was that we had some money, we were a small entrepreneurial firm with low cost structure having money for one year. That meant that we could go and search for a new business model again. So in the fall 2002 we basically rebooted our firm."

So in contrast to other interviewees' pivot experiences, the interviewee from Futurice clearly signaled that the reason for pivoting was a pretty sudden and complete loss of customers, which essentially completely invalidated their product and business model as. As the core offering from Futurice was far from economically feasible at this point, the company was forced to pivot in order to avoid bankruptcy and stay in business. Some other interviewees shared a similar situation where bad financials forced them to pivot, but in these cases the end for the company's product offering was not as imminent as it was for this company back in 2002.

What the company ended up doing then was to use their core competencies as IT professionals to do IT consulting as a side business to generate cash flows that enabled the company to fund the development of a photo sharing service. The team wanted to create a photo sharing service as they saw digital photos

with the surge of new camera phones as a fast-growing industry with huge potential in the future. The interviewee discussed how both of the new business lines were doing well and growing. However, the company faced a problem that was familiar to some of the other interviewed companies as well: one of the business units was not profitable and not performing well enough financially, even though it was popular and well received by end users.

"The photo sharing service was progressing pretty well. We had the same mentality of pushing quickly from development to production, and it indeed got a lot of usage and was moving forward. But there was the problem that during the years we just could not find a business model for it that would have been feasible. So we had users that were happy, the photos and other things, but the business model was an open issue. And at the same time we noticed that customers increasingly wanted more tailored solutions, so when the customer wanted something, they wanted it to be tailored to fit their specific needs really well. They did not really want to buy a pre-packaged solution but wanted something that is more personal for them instead."

"And then in 2007 we just asked ourselves that does this make any sense? Suddenly customers wanted tailored projects a lot more instead of us going to them and telling them what our offering is… and we just could see in 2007 that the project based business is growing 50% - 100% a year with high customer satisfaction and high profitability. So we probably found our product-market fit there, we should probably focus on this... And then at the end of 2007 we decided to focus on tailored customer projects… so we sold the photo sharing service and essentially kicked off Futurice 3.0 from there"

Futurice faced a dilemma where they had a profitable and growing side business with the purpose of generating the cash flow necessary to keep the company afloat while they develop the photo sharing service that was also growing at a good pace with metrics showing end users were happy with the service. The only problem was that the photo sharing service was not generating enough revenue, and the team could not find a viable business model that would let them to focus solely on that service.

With the side business growing fast in terms of revenue and profits, the team decided to pivot as they understood after years of operating that it makes more financial sense to focus on the well-received and profitable business unit instead of focusing on another business that is able to attract end users but fails to generate meaningful revenue.

Also, the interviewee discussed that one possible reason they could not find a suitable business model for the photo sharing service was the fact that the survival of the company did not depend on the success of the service as they could generate necessary cash flows to sustain the company with the tailored customer projects. The interviewee elaborated more on the causes for the eventual pivot and how they still tried for some time to get a functioning business model for their core business:

> *"It raises the question that maybe the reason we never found a working business model was because we didn't have to because our business unit doing customer projects generated money. So maybe it would have focused our efforts if we really had to [rely on the photo sharing service]. So we did try and try, but maybe we just missed that something that OK, now we just have to succeed in this. We had not burned any bridges behind us because we had that project business that carried us on. We did look for many different business models and thought about how to monetize this thing, and we did experiment as well, but..."*

The interviewee continued to explain how they stayed on course with the photo sharing service for a fairly long time, as *"It is really painful to decide that we have to give up our original vision and just do what works in the market"*. The interviewee also added that a key factor for successful NPD is to find the right metrics to follow to understand whether you are progressing well or not, and discussed how it is more difficult to find the key metrics for an entertainment business as for example advertising affects end user satisfaction and behavior on site, and one also has to understand how much money can be used to promote user growth and redemption and so on.

Today, Futurice focuses all its efforts on the IT consulting business that now also entails NPD consulting as well, where they help other companies to internalize a mindset of experimenting with low-cost probes and deciding on the strategy after analyzing the results of the experiments. The

interviewee discussed that for themselves during the first pivot, and for many other startup companies that the interviewee is familiar with, the main driver for pivots is the fear of running out of money, which again is the result of unsatisfactory financial performance of the product or service and the lack of profitability that would enable the company to further pursue the chosen vision.

The discussions with the interviewee from Blooming.io resonate with the observations from our interviewee from Futurice of what factors are the main drivers for pivots. Blooming.io did very intense customer development during the early stages of NPD in order to understand how to build the MVP and to see whether there is any meaningful demand for the product. The interviewee shared that their team invalidated one medical B2C product already during the ideation phase after talking to a lot of different stakeholders, and coming to the conclusion that there was not enough demand to support the building of the actual product. The team then pivoted into another product idea, did a similar rigorous customer development process and was able to validate with sufficient confidence that the new idea is worth pursuing. With having the MVP out in the market for a while now, the interviewee elaborated how their product development team is able to tell whether they are moving into the right direction or not:

"I have done a lot of selling here in Finland and we have a few customers who use the MVP. But we have now concluded that it likely does not work. Having a few customers does not really mean much, because if you want to build something scalable then you do customer development, you meet tens, hundreds of firms, have hundreds of phone calls with potential customers. You then start to quickly form a picture to understand whether this is a thing that people are ready to pay for or not. You have to somehow test it and see that we have an MVP and we are targeting it to a specific market. So, if the market is a triangle shaped hole and we try to move through it you will immediately know if it fits."

"I think one good example is pulled oats. That's a product that they nailed really well, or at least it looks like that at the moment… They seem to have reached PMF because it immediately took off. So if something doesn't really take off and you just have to grind, grind and grind, then you have to consider whether you are selling to the right market, is the target customer the

correct one, and is the product the right one. So in a way if you have a hypothesis of a product and test it to various markets and conclude that it does not work then you just have to change the product if you have not found a market segment where you could sell your product.”

With having acknowledged what PMF looks like, and that a difficulty to sell the product and grow revenues at a satisfying pace is an indicator of larger issues with the product offering, the interviewee continued to discuss how with this information their team was actually about to pivot soon after the interview:

“And now we have come to the conclusion that next week when we have a meeting with the team, we are very likely going to have to pivot. The product just doesn't have enough demand. Or it does but you just feel it, you get too much of the I don't cares… We have realized now that our MVP is not able to reach PMF. Thus, we are forced to do something about it.”

As with some of the other interviewed companies, the interviewee acknowledged the lack of market demand and financial performance as the key reason they intend to pivot. When inquired for more in-depth analysis of what went wrong with their current offering, the interviewee elaborated with a painkiller-vitamin analogy. He discussed how a core value for their team and their vision is to have a painkiller product, where the product solves a real problem that the customers need fixed, whereas a vitamin product is something that is seen as a nice to have but the problem the vitamin fixes is not as dire compared to a problem that needs a painkiller solution. Due to the hardware embedded in their product offering the pricing of the company's product is naturally higher compared to competitors with software-only products, and the interviewee explained how the higher pricing point is only justified if their product is seen as a painkiller and not as a vitamin, nice-to-have product. The interviewee then discussed how it appears now that the market does not agree with the developing team's opinion about the product:

"We have now realized that our offering in the market we targeted is seen as a vitamin and not as a painkiller. We had thought it would be a painkiller product and that was our purpose to make a painkiller and not a vitamin. But now it has turned out so that people see it as a vitamin and do not want to pay for it. The pricing is a mismatch even for B2B markets. And we think that if that is how companies see our product, we do not believe that consumers would see it any differently, instead the consumers would probably also see it as a vitamin and especially would not be ready to pay what is our price for the product."

How did the company then end up in this situation? The interviewee had earlier discussed how they did extensive customer development in order to understand whether a product is desired enough to justify spending time and money to build actual solution and company around it. This process already invalidated one idea, but validated this newer product idea, after which the team built the MVP and sold it to customers but found the revenue to be disappointing. When asked about it, the interviewee explained that their team did similarly to the first product idea very intensive customer development work:

"We had a certain hypothesis of what could work and we did customer development, we did it already back then and we met customers. And we asked what needs they have. Then we formed an understanding, perhaps we were not extensive enough, so now being wiser we would maybe go for a larger number of interviews. But then we got the feeling that this could really work."

"We learned that the companies had a real need like we had hypothesized, but out of the whole mass we went through, hundreds of events combined, only a few [customers] clearly experienced a really strong need that would be solved with our solution. So they really had a clear problem. The majority of the hundreds of events had somewhat considered our product as a nice-to-have, or as a vitamin. And then if I say, I don't know the percentages but approximately 5% consider our product as a solution to a real problem and 95% do not really care about it or see it as a vitamin."

The interviewee further elaborated how customers seeing the solution as a vitamin is a big issue as their product includes more expensive hardware that does not allow them to sell the product for a much cheaper price in order to keep the company profitable. The team did cut their pricing in half at one point, but the interviewee discussed that the cheaper pricing was still seen as too high and did not do much to increase sales. Thus, the interviewee sees a pivot as necessary since the current product in his opinion cannot achieve PMF based on what they have learned, and they cannot find another target segment to sell the existing product with the pricing they have.

The interviewee also recognized that partly the issue of disappointing sales was due to the fact that they had to sell the product to top management who had the budget, even though the most interested party in their company's solution to improve employee well-being was HR. The HR people were familiar with the benefits of the product offering, but the top management who tends to be of older generation did not find an expensive mindfulness product interesting, even though it could be shown to have tangible benefits and ROI on the customer companies in the form of fewer employee absences.

In addition, the interviewee acknowledged the issue of discrepancy between early interest in the product before the MVP, and the lack of sales the team was able to generate when they finally had the product for sale in the market:

> *"Then we progressed into the MVP phase and now we have noticed that it really doesn't [work] when we actually started to sell it. So it is easy for people to say at this stage that "Yeah, we are interested", but it is a really difficult to balance how many sign ups you get into something and how many of them are really going to pay for it. It is really difficult to know it beforehand… even if we have done extensive customer development at all stages."*

> *"We got plenty of offers at this stage. Our product was ready, we had probably tens of thousands of euros worth of offers out from companies. So companies were really interested but when it came to actually paying for the product and close the deals, a large amount of customers dropped out at that stage."*

How the interviewee recalled the issue was in fact discussed by another interviewee as well, who apparently from prior negative experiences had learned that you really need to close sales and not rely on positive interest from potential customers to validate products:

"When it comes to validating we really made the MVP, went into the market and did not just ask someone whether they would buy this thing if it was available. We have a lot of experience where people say that they would buy something, but when we actually build the product they change their minds."

4.4. Summary of Key Findings

To summarize the key findings from the interviews, the collected data is analyzed and categorized into three subgroups: customer development activities, probing activities and pivots. Firstly, as empirical research studies indicated, all the interviewed companies found customer development processes highly useful with qualitative methods dominating the ideation phase, and quantitative data collection supporting qualitative inquiries after going live with the MVP as the companies achieved a larger customer base to draw data from. Nevertheless, discussions and interviews with customers remained important for the interviewed companies to support and guide their NPD.

In addition, most of the interviewed companies clearly had a set of lead users to guide their NPD efforts at the earlier stages, with the goal that a great product for the lead users would also be a good match for a wider customer base as well. Some of the interviewees discussed that they felt lead users helped them to speed time to market as well, as they had to spend less time trying to conform and analyze a larger set of customers. In addition, it was also noteworthy that some of the interviewed companies were less active in customer during the development phase where the companies were building their MVPs after forming an understanding during ideation what features to include.

Another key aspect that was common with the interviewed companies was the trial-and-error approach of using low-cost probes to test new features in the markets. For some of the companies, low-cost probes are an essential part of NPD as a form of customer development. As the interviewee from Futurice elaborated, it is essential in NPD to experiment a lot in order to reduce uncertainties and to understand what works in the market. However, it is also to be expected for companies developing new products that most of these experiments fail and therefore companies should be prepared to perform these experiments cost-efficiently. This way the developing company would be predisposed to a large number of failures that work as great opportunities for learning about the market and the product. The same interviewee also discussed how it is important for companies doing NPD to perform many iterations of experiments in order to have enough confidence in the results of the experiments to validate or invalidate hypotheses. According to the interviewee using only one experiment as a basis for hypothesis validation and forming strategic decisions would be "quite ill-informed decision making".

Finally, after understanding how the interviewed companies collect relevant data to guide them towards PMF and success in the markets, we turn to analyzing the pivots the companies experienced and what led these companies to change course during NPD. Out of eight interviewed companies, two of the interviewees stated their respective firms did not experience any significant pivots during their product lifecycle. Both of these companies added new features to the product and were active in customer development, but the development of their product offering was a natural flow instead of taking corrective actions due to negative market response to their offering.

Both of these interviewees discussed during the interviews that they felt their product offering achieved PMF pretty quickly after the MVP and therefore there was no need for a significant pivot to enhance market performance. Especially the other interviewee added that their MVP was highly profitable from the start and that the company was cash flow positive almost immediately. The other interviewee also discussed that they got positive feedback from customers and were able to grow their revenues year after year and the largest issues for them were scaling problems related to serving a larger customer base and prioritizing customer feedback to enhance the product.

It seems like a no-brainer that companies do not need to pivot during NPD when the new product is highly profitable, customers are satisfied and revenues grow at a good pace. High profitability with good top-line growth does seems to be a good indicator of PMF based on the interviews, but some interviews showed that high customer satisfaction and revenue growth do not necessarily indicate that the company has achieved PMF and is headed in the right direction.

Out of the interview sample, most of the case companies showed high interest from customers and end users towards their product. For example, Wolt had a large buzz around their product at the time when they only focused as a payment app for faster takeaway food, and the interviewee discussed that there were many lead users who fell in love with the initial product as well. However, the company ended up making a pivot after making a low-cost probe to experiment with home deliveries. Even though the initial product was already well-received and growing pretty fast, the popularity of home deliveries surprised the developing team as they now experienced higher growth and were able to validate the new feature economically as customers were willing to pay sufficiently for home deliveries. In their case, the pivot was the result of new experiments that allowed the team to find new features that surpass original product features in popularity, giving new direction for the company. However, it was also clear that the original product was also doing pretty well until that point and without the

experiment the company possibly would never have pivoted, but instead would have continued with their focus of being a quick payment system for takeaway food. As the interviewee explained, the sudden huge take off and growth bottleneck was a clear signal that they had found a PMF for their product that would grow much faster than the original product.

Some of the other interviewed companies also showed the importance of probing experiments to help in making new products successful in the market. The interviewee from Smarp discussed how their strategy changed a lot after adding a new feature to the product. After showcasing the new feature, all the potential customers wanted was that feature as a standalone product instead of the wider product feature range. As the customers were clearly willing to buy that feature, the developing team understood that they had likely found their PMF and should focus on this one feature alone. However, compared to the case of Wolt, the founder here recalled that their team was also a bit disappointed with the revenue growth with the old, more feature-rich product as they had more difficulties in closing sales with that product. The new feature instead had a clear pull effect and changed the dynamics where the founders didn't need to push their product as hard to the customers in order to make sales.

In contrast to the zoom-in pivot experience, Virgo had experienced a zoom-out pivot where their team realized during MVP development that a focused product does not solve customer needs, as they realized that a suitable product has multiple stakeholders that need paying attention to. Realizing this, the team had to cater their product more to wider range of users in order to please the end customer who is paying for the product, and thus the company ended up making a zoom-out pivot where they had to add new features and layers to the product. The interviewee elaborated that initial sales were difficult to do with the focused product, and this fact combined with discussions with lead users led the team to understand the need for the pivot. After spending more time to build new layers to the MVP, the interviewee felt their team had found PMF for a specific segment of customers as they were able to increase their sales. In their case, it seems the pivot trigger was the realization that a focused product would not be economically viable in the long run, as selling it was found to be difficult.

A highly similar pivoting trigger was found with other interviewed companies as well, where the interviewees discussed how they saw a need for pivot due to lack of revenue. Blooming.io found it too difficult to close sales, and that most of the B2B customers saw their product as a nice to have instead of a truly needed problem solver, which in turn invalidated their existing business model as it had a fairly high price that relied on the customers seeing it as a solution to a real problem that needs fixing.

The company had tried to change pricing, but with disappointing results they also thought changing target market would not be sufficient to help them achieve meaningful revenues. According to the interviewee, the company just had to push sales too much and that indicated to the team that the business model is likely not going to fly in the future either; a really valuable solution would not find closing sales to be so difficult. Thus, the interviewee thought a pivot was necessary for their company, and they eventually ended up pivoting from B2B business to target the medical industry with a new product that has a new angle to the one the company sold during the interview.

At Kiosked, the interviewee discussed how their company realized they had a real issue with turning end users to purchasers with their ecommerce business model, even though the users did interact with the product a lot. As they too understood that their progress in terms of revenue was just too small, the team ended up making an experiment to test out a more traditional advertisement-based business model instead of ecommerce transaction based one. The new experimented model immediately took off and turned user interactions into revenue much better than the old ecommerce unit. With hugely improved revenue growth from there on, Kiosked felt they had now finally found their PMF and made the pivot to focus on the new feature. According to the interviewee, the pivot was a no-brainer as revenue increased dramatically with the new unit and they already had issues with the older business model.

Futurice was a company that experienced two pivots, with the other one being forced upon them as they suddenly lost all customers and all cash inflows that would allow them to stay in business. Thus, they revamped their product completely and switched to create a photo sharing service together with supportive IT consulting unit to earn them cashflows that would lend them time to find a profitable business model for the photo sharing service for consumers. However, after some years the team failed to find a sustainable business model for the photo sharing service even after multiple experiments and iterations, and decided to exit this business unit by selling it to another company so they could focus on the business unit that is both growing and generating profits for them.

A commonality between all of these companies was that they were led to a pivot due to a lack of revenue, and it was apparent that with the original business model these companies relied on would not have been financially sustainable without external funding. Also, the interviewees from Blooming.io, Kiosked and Futurice felt that even though they did make iterations to improve their product, they thought that their progress was way too slow to justify the current strategy, as satisfactory revenue was just too far off with the evidence they had from iterations and how it affected revenue growth.

After analyzing all the interviews, a few insights arose from the interview data to explain why companies end up making pivots and what supporting evidence companies use to justify these strategic changes. Also, insights were learned on how companies could tell that they were on the right track and could comfortably choose to maintain their strategic course with confidence that they have found a PMF that would allow them to succeed with their new products in the marketplace.

One of the interviewees summed up nicely what he thought was the most common reason why companies make pivots:

"Usually it occurs when the end really is in your sight. Unfortunately, it often proceeds to the point where you have to face the reality of the situation when you really are afraid that this thing is not going to fly... I have witnessed from the sidelines a couple of others where suddenly a lot of time, too much time has gone by and it starts to look like you are actually going to run out of money soon or go bankrupt. So then you start to think that OK, let's do this differently, let's face the reality of the situation and figure out how to dig ourselves out of this hole and so forth."

These observations from the interviewee are supported by the data from the interviews, where the main reason for pivoting seemed to be disappointing sales revenue. Also, it was apparent from a few interviews that the low revenues appeared to risk the survival of the company as the cash flows to sustain and grow the business were not sufficient enough to keep the company up and running for a long period of time. In these instances, the pivots could be characterized as being more radical in nature, as the developing teams ended up making more distant search in order to find a working business model instead of just adjusting the original business model a bit. The finding is congruent with the research findings by Andries, Debackere and van Looy (2013), where the authors found companies to more commonly alter their products radically when the case companies had faced disappointing sales for a prolonged period of time. In addition, Virgo saw the need for a zoom-out pivot early on as they understood they could not sell the product without widening its scope and attend to multiple stakeholders' needs. However, their pivot could be described more as local search where the business

model was not altered radically, but the product had to include new important features to suit customer needs.

Another key reason for pivoting arose from explorative activities of companies, where the interviewed companies made experiments for significant new features and found an unexpectedly high customer demand for them. In all the cases the surprisingly large success that followed these features were significant enough to eventually radically change the strategic course of the whole company. For some of these companies making pivots, the new business model explorations were the result of disappointing results with prior models that would sooner or later risk the company's survival, as was the case with Kiosked and Futurice's first pivot. However, some of the companies doing explorative trial-and-error activities were not so much led by lacking sales performance with the prior business models, but instead by the desire to gain new knowledge from experiments to help in reaching PMF for their product. For companies like Smarp and Wolt, these experiments yielded surprisingly positive results and therefore motivated the companies to pivot as the new features generated huge growth in interest for their products.

Earlier research studies have given evidence for the usefulness of trial-and-error learning and experimentation, and how these processes benefit companies in the long-term (Andries et al., 2013; Bingham and Davis, 2012; Ott, Eisenhardt and Bingham, 2017). However, earlier studies have not shown a direct link with pivots and experimentation, but rather have argued that the stepwise process and local search guides the NPD via smaller iterations. In this study, experimentation was shown to lead into pivots within a short time frame, showcasing the benefits that prior research had evidenced.

Lastly, we also learnt some insights on how companies were able to tell they were on the right track and what justified pivoting decisions. On the other hand, similar insights were found from the companies that did not need to pivot in the first place, as in the case with Feedbackly and Smartly.io. For Smartly.io, the key indicator that the company was on the right track was profitability and strong revenue growth right from the get go. The third point for them was high customer satisfaction, and this was a key factor for Feedbackly as well, as the interviewee felt their customers were generally happy and they were able to grow revenues at a good pace. Also, for the companies that did pivots the key indicator to consider the new direction and business model as the one they should focus on was a much stronger revenue growth compared to the older business model. It is important to note that almost all of the interviewees that had experienced pivots considered their company to have reached PMF with the

new business model after the pivot, as in general sales and customer satisfaction had improved a lot. However, as Futurice's pivot to build a photo sharing service showed, end user satisfaction alone does not indicate a good PMF if the business model does not generate sufficient cash flows to sustain the company.

In addition, one notable aspect found from the interview data was the fact that the companies making pivots due to surprisingly high customer demand after the introduction of new features essentially committed to the pivot quite quickly with basically a single iteration that seemed to prove the team had found a better business model to follow. On the other hand, the companies that pivoted due to disappointing sales performance lingered much longer with their original business model, and did many iterations to try and make the business model work. However, these companies eventually decided to try and change the business model via distant search by radically changing the product for an experiment and consequently making an almost completely revamped product. It seems the reason for the eventual pivot was fear of running out of money, as one of our interviewees thought is the most common reason for pivoting.

In conclusion, the pivots in the interviewed companies seemed to have been generated due to two main reasons: badly performing business models that took a longer time to invalidate, and positive surprises from somewhat distant search experimentation. The lingering business models that had disappointing sales performance eventually led to distant search experimentation, as the companies were forced to figure out new ways to revive themselves and dig themselves out of a low-growth hole. However, in both instances experimentation was a relevant reason for pivoting, as the pivoted companies first wanted to have clear evidence that the new business model would perform better than the old one.

Another key insight arising from the coded interview data was that pivots that were done for positive reasons were generally made on much faster notice compared to pivots motivated by negative performance. It seems the positive performance pivots were much easier to validate, as the earlier business models had been developed for some time in the interviewed companies. This left the interviewees confident that if the new probe worked much better than the older business model from the get go, then the new business model is likely worth focusing as the older model had already been worked through multiple iteration in order to improve it. On the other hand, the negative performance - based pivots generally took a longer time to invalidate, and this is probably partly because the teams had focused on one business model and had no better business model option available for them. This

finding very closely supports the findings by Andries, Debackere and van Looy (2013), who found in their study that companies doing distant search commonly did so because they had initially focused too closely on one business model and after running into issues with it, they were forced to iterate radically in order to have meaningful impact on the company. However, there was no clear-cut evidence that the companies with pivots motivated by positive performance surprises were more willing to learn or had more learning processes in place in comparison to companies that lingered with their badly performing business models for a longer time. In addition, the interview evidence here seems to support that more distant search experimentation with low-cost probes is worthwhile for companies, as they can lead to positive surprises and give the companies fairly quickly evidence of a better business model compared to the one the company has its main focus on.

Table 3 below presents the relevant research findings of why companies from the interview sample made pivots, how they were led to believe the new business model after the pivot was the right strategic course to take and what reasons led them to believe the older business model would not achieve PMF and relevant commercial success in the future compared to the newer business model.

Company	Number of pivots & Time to validate the need to pivot	Driver for the pivot	Justification for new business model
Blooming.io	One pivot. Pivoting decision took some months.	Disappointing sales data - difficulty to close sales	Current business model is seen as a vitamin and not a painkiller – impossible to make the old business model sustainable
Virgo (name changed)	One zoom-out pivot. Pivoting decision done fairly quickly at early customer development phase.	Active customer involvement via direct feedback - cannot close sales without a more diversified solution	Customers directly told they needed a more diversified solution so that they would buy the product
Feedbackly	No pivots	No need to pivot. Customer satisfaction is high and user data shows end users interact with the product	Growing revenues, new features receive positive feedback from customers.

Futurice	Two pivots. Pivoting decision took multiple years and took a long time to validate.	1) Disappointing sales data. Complete loss of customers jeopardized the future of the company 2) Disappointing sales data. Could not find a suitable business model despite end user satisfaction and growth	The current business model was profitable and growing just like the photo sharing service. However, only one of them brought in relevant revenue so the team followed the money.
Kiosked	One pivot. Pivoting took years to happen but the new business model via experiment was validated in one week	Disappointing sales data & successful experiment. End user interaction did not convert to buying actions. Lack of revenue risked the future of the company	The new model was able to turn end user interactions into revenue much easier, leading to much higher revenue growth.
Smarp	Two pivots. Zoom-in pivot. Pivoting took some months to happen but the new business model was validated within weeks.	1) Switched to online consulting due to scalability. 2) New feature experiment led to high demand	Clear demand from customers towards the new feature, and they clearly stated they only want to pay for that sole feature.
Smartly.io	No pivots.	No need to pivot. Sales data and customer feedback very positive. Growing revenue and high profitability from the start	Product received positive feedback from customers and was profitable and growing from the start.
Wolt	One pivot. Pivoting was done very quickly within weeks.	New feature experiment led to high demand	The new feature grew revenues faster than the older model and received very high customer satisfaction.

Table 3: Interviewed companies and pivots

5. Conclusion and Discussion

Motivated by the literature and research on corporate agility of new ventures operating under uncertainty, this study aims to clarify how companies developing new products reduce uncertainties and decide what business model and strategy to implement to enhance the probability of success. Prior research points out companies benefit from an effectual logic where new ventures are developed iteratively with a step-by-step process that allows for analyzing the impact of any changes in the business model, product reception or sales (Andries, Debackere and van Looy, 2013; Berends, Jelinek, Reymen and Stultiëns, 2014; Ries, 2011; Maurya, 2012; Croll and Yoskovitz, 2013). Companies that thoughtfully validate their hypotheses via experiments are more open to learning from failures in real-time during product development instead of merely relying on post-failure learning, something that research has shown to be less effective and trickier to achieve (Corbett, Neck and DeTienne, 2007). Closely related to experimental trial-and-error learning is constantly seeking feedback from customers either qualitatively or quantitatively, and a multitude of studies show that actively involving customers in NPD is an effective way of dissolving uncertainties and guiding the developing company towards PMF and a sustainable business model (Coviello and Joseph, 2012; Haapasalo and Suikki, 2006; Laage-Hellman, Lind and Perna, 2014; Graner and Mißler-Behr, 2015).

This thesis study contributes to existing research by studying the effectiveness of the aforementioned elements in the Finnish IT sector, giving insights into how companies dissolve uncertainties engrained in new venture development. It seems apparent from the interview data that high customer involvement throughout the product lifecycle from ideation to PMF are crucial in forming the understanding of whether a product can work in the market or not customer satisfaction wise, and all of the interviewed companies actively involved customers through all stages of NPD, aside from the development phase in some cases. If the developing team was able to make a plausible case for a new product and that it has a good chance of solving relevant customer needs with a sizable enough market, then the vision was thought to be worth pursuing. The interview data also revealed that it is common to not nail the product right away but the developing teams had to iterate the product for some time, either incrementally or radically via pivots, to reach a PMF that sets the companies up for more rapid revenue growth and enables the company to reach scaling phase.

Another crucial element to find the right strategy according to interview data was found to be experimenting and trial-and-error learning, as previously indicated by various research studies (Andries, Debackere and van Looy, 2013; Bingham and Davis, 2012; Ott, Eisenhardt and Bingham, 2017; Berends, Jelinek, Reymen and Stultiëns, 2014). The interview data in this study strongly supports prior research evidence, as the effectual approach was clearly dominant in all of the interviewee's description of their company's approach to NPD. The companies varied in the amount of experiments they made during NPD, but it became clear this process was important for all of them in identifying the business model their company should focus on. The thesis study thus supports academic theory suggesting that effectual logic, experimental learning and active customer involvement all promote corporate agility, as many of the interviewees made swift decisions to pivot their business model throughout the product lifecycle.

As corporate agility today is generally considered to denote the ability to make strategic changes quickly and adapt to the business environment, it would be helpful to better understand with greater detail what factors give companies developing new products substantial enough reasons to focus on a single business model, even if the results so far during the business model's development do not meet expectations. Particularly, the purpose of this thesis was to understand how and why agile companies make radical changes to strategy or core business model, and how they proceeded to ensure that in the case of pivot their choice was prudent with a high reason to believe that the older business model would not have succeeded in the market - even if the older business model would have been developed further through small iterations in the future. As one of the interviewees stated the problem:

"But how long should you push your vision forward and when do you start to change… if you give up too early then nothing great can ever be created. If you linger for too long, then it is stupidity. But when do you find the right moment [to pivot]?"

From the interview data, a couple of relevant factors for business model selection and pivoting reasons could be detected. Firstly, some of the interviewees clearly stated that the main reason for the pivot their companies made was the lack of sales. Some companies, like Futurice and Kiosked relied more on end users generating revenue through interaction and desired actions within their product, but these

companies were led to pivot as they understood that the incremental improvements to help converting users into revenue were just too ineffective to have a meaningful impact that would clearly set the companies on growth phase.

The interviewee from Blooming.io also discussed how their team similarly had issues in converting early interest into sales when in direct contact with customers, leading the team to reason that their existing business model is faulted. Virgo also understood at an early stage that customers were not willing to buy their focused product offering, and thus the customer development process led them to make a zoom-out pivot. In all of these cases the pivots were also triggered by the fact that low revenues meant burning money to stay in business, and the companies would not have been sustainable in the long-term with the business model prior to the pivot. Some studies, like the research paper by Andries, Debackere and van Looy (2013), had similar conclusions as the authors found that companies doing radically different business model experiments from current business model are led to making these experiments due to disappointing sales performance of the new venture.

Another key factor leading to pivots was the surprising performance of new experiments in the marketplace. Especially showcasing the usefulness of experimental learning was Wolt and Smarp, who made pivots due to successful low-risk experiments that led to surprisingly high new demand, leading the companies to shift their focus from their existing business model to reflect the new findings from the experiments. Earlier research studies strongly supported this probe and learning process, suggesting companies can develop their business model faster and more effectively this way by learning directly from the marketplace (Brown and Eisenhardt, 1997; Ott, Eisenhardt and Bingham, 2017; Andries, Debackere and van Looy, 2013).

However, earlier research studies did not focus specifically on how and why companies make pivots, and what are the main drivers for a radical business model change. The thesis adds to existing theory by indicating that reasons for pivots in the study sample can be divided into two categories: negative lingering with current business model or positive surprises from experiments. It became apparent from the interviews that all the interviewees were confident early on that their vision has strong merit and is worth pursuing. As our interviewee from Futurice stated, a company cannot base pivoting decisions quickly on short-term failures with little iteration as one should not give up too early, but instead it is needed to iterate a business model incrementally multiple times in order to eventually invalidate it with robust enough data. How long time this takes depends on the type of company and the speed of which

relevant experiments via probes can be done, but generally it seemed to be a question of at least multiple months in the study sample.

The interview data also showed that making experiments can lead to positive surprises that immediately show higher growth, profitability or customer satisfaction compared to the core business model in focus. The key factor especially for the pivot seemed to be a meaningful increase in revenue growth that led companies to validate a new business model very quickly in comparison to the companies with negative experiences of lingering bad performance business models that were developed for a longer period of time before invalidation.

Thus, it can be inferred with comparative evidence that experimentation can be a strong promoter for corporate agility and adaptability. Prior studies on corporate agility have been more focused on what processes make companies more flexible, how companies learn from failures and whether there are any temporal sequences to learning. This thesis study adds to existing theory by showing that experimentation can very quickly lead to radical pivots for companies.

In conclusion, this thesis study adds to existing research theory by showing that agile companies pivot for positive surprises or negative performance reasons, and that there is a link between the time it takes to pivot and whether it was made for negative or positive reasons. The study here shows that experimental learning is a key driver for quicker decision making by revealing possible new opportunities that immediately show larger potential compared to existing business model focus. Pivots rooted in negative performance are shown to be more time-consuming in this study, as the interview data and some prior studies show that companies need more time for business model invalidation compared to clear signs that validate the effectiveness new business models.

The study sample also gives the insight that the main driver or key performance indicator for pivoting for both positive and negative reasons is sales performance, as it works as a great proxy for customer satisfaction and validates that the new product is solving a real need and has commercial merit. Relying on purely end user or customer satisfaction is not dependable enough for business model selection, as profitability is a crucial point to achieve for new ventures as especially startup companies are often restricted when it comes to resources, and explorative business units in larger corporations also risk the ceasing of new funding from top management if customer satisfaction potential is difficult to turn into revenue and profits. Revenue is an important indicator of performance in new ventures as it is a good

proxy of customer satisfaction and prerequisite for profitability. The study does not suggest it is the only meaningful indicator to follow, but one of the most important ones that lead companies to pivot their business model.

5.1. Suggestions for Future Research

Knowing the key processes that promote corporate agility and help in guiding new ventures under high levels of uncertainty, further research could be done to better understand the key performance indicators or metrics in various industry sectors that companies doing business in these sectors should follow. As research data indicates, lingering business models are common and thus it would be beneficial to have studies suggesting what type of performance drivers and measures should be followed to be able to invalidate or validate business models more quickly. A study with a large sample size could achieve this goal, and thus would be a helpful aid to companies building new products so they would have the ability to benchmark and track progress more effectively. As stated previously, companies can also have contradicting performance indicators as new products can show high potential in end user or customer satisfaction and interest, but they can nevertheless prove difficult to find a suitable business model that drives revenue growth.

Further studies could also be done to dig deeper into whether quick pivots due to positive experiences with experiments are commonly the better options to make compared to iterating further with current business model. Andries, Debackere and van Looy (2013) showed that companies having multiple possible development paths through experimentation eventually converge to the one that has the biggest potential. In this thesis the studied companies made focused experiments one at a time, and were quick to change strategy when a new experiment showed large potential.

The companies could not afford to test multiple different development paths at the same time due to resource constraints, and this fact generates interest for future research. Further research could focus on larger companies with large R&D units doing experimentation beside the core business. According to earlier research, larger companies could hold a competitive advantage as with a larger resource base

they could afford to simultaneously run multiple experimental business model while focusing sufficient resources both on new experimental business models, as well as developing the older core model further. Thus, larger resource-rich companies could theoretically run a larger amount of experiments and develop them further than startups to see what business model eventually wins the race. By studying these larger companies, future studies could shine further light into whether extreme agility via quick pivots arising from experiments are beneficial compared to a longer experimentation cycle where the products are developed more fully instead of relying on first data from low-cost probes.

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7. Appendix – Interview Structure

Interview Questions:

1. Can you please discuss the history of how your company originally came up with your main product offering from initial business idea to the product we are seeing today? What was the original vision and has that changed through time in any way?

2. Can you recollect any major challenges or uncertainties throughout the lifecycle of your product? How did you resolve these situations?

3. What type of data is important for your company when deciding how to develop your product? How do you use this data in order to make any strategic choices?

1) Ideation phase		3) Product/Market fit (PMF) phase

PRODUCT LIFECYCLE

2) Minimum Viable Product (MVP) phase		4) Growth & Scale phase