

MASTERING DISRUPTIVE INNOVATION

Troubleshooting for Finnish High-Tech Start-Ups

Liisa Majamäki

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JYVÄSKYLÄN AMMATTIKORKEAKOULU
JAMK UNIVERSITY OF APPLIED SCIENCES



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<p>Abstract</p> <p>In recent years, disruptive innovation has attracted increasing attention worldwide. Also in Finland, investments are increasingly directed towards disruptive innovations: even though the risks of investing in disruptive innovations are high, the returns, in a successful case, are expected to be considerably more significant than those from investing in sustaining ones. Regardless of the country's focus on high-tech and heavy investments in R&D, it has been able to foster few start-ups into international success stories. Therefore, as the increasing investments in disruptive innovations are likely to further increase the attempts of high-tech start-ups to excel in disruptive innovation, the objective of the study was to identify the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations and explore how to successfully overcome those challenges.</p> <p>Given the nature of the research objectives, a qualitative research approach was selected. Christensen's five principles of disruptive technology were used as the main theoretical framework. To dig deep, a multi-method case study – a documentary analysis and an interview – and an expert interview were conducted. The case company is a Finnish high-tech company that has commenced as a start-up and has successfully commercialized a disruptive innovation. In the expert interview, a professional with extensive experience in advising Finnish high-tech start-ups, was interviewed.</p> <p>The results show that the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations include identifying disruptive innovations that have market potential, the length and riskiness of the process, obtaining adequate funding at initial stages of the business and marketing the disruptive innovation. The research also revealed that successfully overcoming the challenges identified requires e.g. comprehensive understanding of the industry and the incalculable nature of disruptive innovations, ability to evaluate critically, tolerance of risk, carefully planned budget and growth predictions, and using consultancy services. The study also offered several suggestions for further research, such as the problems related to the early-stage funding from investors' perspective, issues related to the usage of consultancy services, and the existence of possible correlation between disruptive innovation and growth.</p>		
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<p>Tiivistelmä</p> <p>Mullistava innovaatio on viime vuosina saanut osakseen yhä enemmän huomiota maailmanlaajuisesti. Myös Suomessa sijoitusten kohdistaminen mullistaviin innovaatioihin on lisääntynyt. Vaikka mullistaviin innovaatioihin sijoittaminen on riskialtista, menestyneessä tapauksessa myös tuoton voi odottaa olevan huomattavasti merkittävämpi kuin vähittäisiin innovaatioihin sijoitettaessa. Huolimatta Suomen high-tech -suuntautumisesta ja runsaista sijoituksista tutkimukseen ja kehitykseen, maa ei ole kyennyt kasvattamaan monia start-up -yrityksiä kansainvälisiksi menestystarinoiksi. Koska lisääntyneet sijoitukset mullistaviin innovaatioihin tulevat todennäköisesti lisäämään high-tech start-up:ien mahdollisuuksia kunnostautua, tutkimuksen tavoite oli tunnistaa tärkeimmät haasteet, joita suomalaiset high-tech start-up:it kohtaavat tavoitellessaan mullistavia innovaatioita, ja tutkia, kuinka voittaa nuo haasteet menestyksekkäästi.</p> <p>Tutkimustavoitteiden luonne huomioiden tutkimukseen valittiin kvalitatiivinen lähestymistapa. Christensenin mullistavan teknologian viittä periaatetta käytettiin pääasiallisena teoreettisena runkona. Aiheeseen syvälle pääsemiseksi suoritettiin monimenetelmäinen tapaus tutkimus – dokumenttianalyysi ja haastattelu – ja asiantuntijahaastattelu. Tapausyritys on suomalainen start-up:ina aloittanut high-tech -yritys, joka on menestyksekkäästi kaupallistanut mullistavan innovaation. Asiantuntijahaastattelussa haastateltiin kokenutta suomalaista high-tech start-up:ien neuvonnasta vastaavaa ammattilaista.</p> <p>Tulokset osoittavat, että tärkeimmät haasteet, joita suomalaiset high-tech start-up:it kohtaavat tavoitellessaan mullistavia innovaatioita, ovat markkinapotentiaalia sisältävien mullistavien innovaatioiden tunnistaminen, prosessin pituus ja riskialttius, riittävän rahoituksen saaminen liiketoiminnan alussa ja mullistavan innovaation markkinointi. Tutkimus paljasti myös, että haasteiden menestyksekkäs voittaminen vaatii mm. toimialan kattavaa tuntemusta, mullistavien innovaatioiden ennalta-arvaamattoman luonteen ymmärrystä, kykyä arvioida kriittisesti, riskinsietokykyä, huolellisesti suunniteltua budjettia ja kasvuennusteita sekä konsulttipalveluiden käyttöä. Myös useita lisätutkimusehdotuksia löytyi, kuten varhaisen vaiheen rahoituksen ongelmat sijoittajien näkökulmasta, konsulttipalveluiden käyttöön liittyvät asiat sekä mullistavan innovaation ja kasvun välinen mahdollinen korrelaatio.</p>		
Avainsanat (asiasanat) Mullistava innovaatio, radikaali innovaatio, mullistava teknologia, high-tech, start-up, Suomi		
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1 INTRODUCTION

The past decades have seen the world – and the markets – change rapidly, and the change seems to continue at an ever-increasing pace. According to Hamel (2000, 18), “the latitude for innovation has never been broader – if only our minds can stretch to it”. New products constantly emerge in every field, creating new needs that people have not earlier been aware of. In these days’ fast-changing world, it is probably more important than ever to be able to renew yourself, your business, your products and your services. Today’s success products are not enough to create tomorrow’s results (Solatie and Mäkeläinen 2009, 17).

Because of the ever-increasing pace of changes, offering successful products or services is now harder than ever. Moreover, according to Kotler, Armstrong, Saunders and Wong (2002), to prosper in new-product development may be even more difficult in the future. Increased competition has made the markets more fragmented, meaning that instead of aiming at the mass market, companies must now focus on smaller market segments, with smaller sales and also smaller profits. There is also increased pressure caused by society and government alike on meeting certain standards, and tightened legislation concerning consumer safety and environmental issues, not to mention the increased costs of manufacturing, media and distribution. These factors also lead to increased copying and imitation, making the life-span of a new product shorter than ever. Furthermore, also customers’ tastes and competition change so fast that new products and services must be constantly developed in order to grow and to stay profitable. Therefore, it is clear that companies must endlessly reinvent themselves in order to answer the changing needs of customers – and if they fail to do so, then competitors will. (pp. 497, 501)

Whiteley and Hessian (1996, 48) quote Gary Tooker, the former CEO of Motorola, who has said that “With new processes and new technologies, you want to replace yourself instead of letting someone else to do it. Success comes from a constant focus on renewal”. This implies that innovativeness can give a company a competitive advantage over competitors.

Even though the importance of innovativeness has increasingly gained column space in the business world lately, it is not a fad. According to Solatie and Mäkeläinen (2009, 21), as far back as from the times of dinosaurs, the fact is that the ones who stay alive are not the biggest, but the ones who have the most ability to change – and the best way to change is to innovate. Moreover, Hamel (2000) reminds that for everyone there is a competitor who will eventually make one's strategy obsolete. To avoid this, it is essential to be an early mover – to “out-innovate the innovators”. (p. 11)

Because of the increased pressure to be innovative, companies often focus on improving existing products and asking customers what they want – even though customers do not know what they will want in the future. Steve Jobs – one of the founders of the IT giant Apple and a legendary visionary – once said that “most of the time people don't know what they want until you show it to them” (Gallo 2010, 112). Therefore, focusing on customers' existing needs can, in fact, be deceitful.

Sometimes improvements created in existing products are above the market needs – too complicated, too many features, too expensive. Successful companies tend to focus on sustaining innovations – increasing features and making minor improvements – and that is when new-comers can ‘attack’ the less attractive market segment by introducing a completely new type of solution to the existing problem, which, over time, will become the mainstream solution. These types of innovations are called disruptive innovations. (Christensen 2000) Disruptive innovations have occurred – and are occurring – in several industries. For example, steamships have disrupted sailing ships, music downloads have disrupted the CD industry, traditional newspapers are facing disruption by online news services, and online shopping is disrupting high street retailing (Trott 2012, 27). Hamel (2012, 66) states that innovators constantly observe small things that are changing but are yet unnoticed or unappreciated by market leaders – things that could be exploited to revolutionize the industry. The focus of this thesis lies on disruptive innovations and the challenges that Finnish high-tech start-ups face in pursuing them.

1.1 Benefits of Disruptive Innovation

When examining disruptive innovation as a larger phenomenon, there is evidence that succeeding in it can lead to high growth. Several companies have successfully mastered disruptive innovation and achieved impressive growth rates on a timescale of just few years. (see Christensen 2007) Disruptive innovations have had a transforming effect on many industries and positively contributed towards consumer welfare and corporate profits (Christensen 2007, 20). Disruption can take place in any product or service market. In fact, it can even be utilized in examining competition between national economies. (Christensen, Anthony and Roth 2004, 270)

According to research, a considerable amount of successful, high-value companies are based on disruption (see Christensen 2007). Furthermore, it has been established that 86 percent of disruptive projects perform above the financial projections. Therefore, companies aiming at creating new growth businesses should have their focus on disruptive innovation. (Christensen 2007, 18)

Focusing on disruptive innovation also brings other benefits to a company. Christensen (2007) argues that it can help in noticing other disruptors and to take responsive action early on. It also helps in identifying overshooting and therefore in managing one's own innovations better. Furthermore, the same tools that are needed to succeed in disruptive innovation are also essential in any attempts to create growth and innovation. (pp. 18-19)

However, as in any issue, there are supporting views but also opinions against it. There are several viewpoints on innovation and some support innovations that are sustaining in nature: that build on existing products or services and do not offer radical changes (see e.g. Maital and Seshadri 2007). In fact, most innovations are not disruptive: a large proportion of the most important and most profitable innovations are sustaining in nature (Christensen et al. 2004, 270). However, Christensen (2000) argues that the methods that are generally viewed as good management – i.e.

listening to customers, investing in promising high-margin products and focusing on large markets – are, in fact, only appropriate in some circumstances. According to his research, this type of ‘good management’ has led to the failure of several top performing companies, as they have ignored the disruptive innovations that have emerged to overtake their markets. Therefore, in some circumstances, good management is exactly the opposite. (Christensen 2000)

1.2 Innovation in Finland

In order to gain a thorough, deep understanding of disruptive innovation and the challenges that Finnish high-tech start-ups face in pursuing them, it is relevant at first to take a look at innovation in Finland and reflect the situation internationally. Innovativeness plays a central role in the success of the world’s top companies. Comments of the management of Deloitte Technology Fast 500 2012 winners of North America, Asia-Pacific and EMEA region all imply or clearly state their emphasis on long-term innovativeness (see Deloitte 2012a, Deloitte 2012b, and Deloitte 2012c, 10). This clarifies the importance that innovativeness has on creating successful business.

Roland Xavier, Kelley, Kew, Herrington and Vorderwülbecke (2013) classify Finland as an innovation-driven economy, along with the vast majority of other European Union countries. This means that the development in the country is advanced and businesses are knowledge-intensive, with entrepreneurship and innovation playing a major role. (pp. 14, 19)

1.2.1 Finnish Innovation System

To understand the topic thoroughly, a closer look on the Finnish innovation system must be taken. There is no single universal definition to describe the concept of a national innovation system. Freeman (1987) defines national innovation system as “-- the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies”. Nelson (1993) defines the same as “-- a set of institutions whose interactions determine the

innovative performance -- of national firms". Common to the definitions is interaction. (National Innovation Systems 1997, 9-10)

Seppälä (2006) describes the national innovation system as a broad entity that includes the producers of new information and know-how such as universities, research centers and companies; their utilizers such as companies, private citizens, decision makers of national development, and administration; and the multifaceted interactive relations between them. The focal parts in the system are education, research, product development and knowledge-intensive business, with international co-operation playing a significant role in it. (Seppälä 2006)

1.2.2 Main Actors in the Finnish Innovation System

When discussing the decisions made to develop the innovation system, the term innovation policy is used. The main responsibility of Finland's innovation policy lies on The Ministry of Employment and the Economy. The development of the system is organized by the Research and Innovation Council, which the Prime Minister is in charge of. (Työ- ja elinkeinoministeriö 2013)

When inspecting the Finnish innovation system in a national level, the main actors include the following: ministries, science and technology council of the state, Academy of Finland, Tekes, Sitra, universities, VTT, sectoral research centers, Finpro, Finnvera, Industry Investment and private equity investors. In addition to large national actors, the Finnish innovation system consists of several relatively small organizations. In a local level, technology centers, Employment and Economic Development Centers (TE-keskukset), so-called expertise centers, local private equity investors and industry offices of councils form the key actors of the innovation system. (Suomi innovaatiotoiminnan kärkimaaksi 2005, 15)

Even though in international standards the co-operation between the actors is relatively smooth, there is still a problem with the smaller organizations having overlapping functions. Furthermore, there is room for improvement in terms of local

and national actors following the same strategy cooperatively. (Suomi innovaatiotoiminnan kärkimaaksi 2005, 15) Työ- ja elinkeinoministeriö (2010, 14) further argues that the system has evolved in terms of complexity, and especially innovative, small and young companies perceive the system as complicated. The innovation system as a whole is evaluated to work satisfactorily, but it is also perceived that it is not equally suited to serve small, fast-growing businesses. (Työ- ja elinkeinoministeriö 2010, 14) However, the direction is that the Finnish enterprise policy has moved towards acknowledging new ventures and risky start-ups (see Rouvinen and Pajarinen 2012, 51-52).

1.2.3 Finnish Innovation Environment

In addition to the innovation system, there has been growing emphasis towards discussion of the innovation environment, as the innovation system alone does not cover all meaningful factors related to the innovation activity of a country (Suomi innovaatiotoiminnan kärkimaaksi 2005, 15). Laitinen (2010, 1) refers to Kolehmainen and Ranta (2009) in describing the innovation environment as “an overall operating environment of the businesses, particularly from the innovation point of view”. The innovation system is the building block of the innovation environment. Furthermore, other key elements include innovation culture, creative processes, global information channels, and common innovation awareness and shared interpretative frames of reference. (Suomi innovaatiotoiminnan kärkimaaksi 2005, 15)

The growing emphasis towards discussion of the innovation environment can be largely explained by the observation that it fosters innovativeness. It has been established that supportive and dynamic innovation environment where ability to take risks is high leads to the highest levels of innovativeness. (Suomi innovaatiotoiminnan kärkimaaksi 2005, 15)

1.2.4 Performance of the Finnish Innovation System

Finland has been one of the leading countries in several global competitiveness rankings, and the innovation environment is internationally considered as top-class. The country invests heavily in research and development, excels in technology and start-ups are fostered by venture capital funding. (Ruohonen 2007, 2) Growth entrepreneurship is politically highly valued in Finland, and for at least the past decade it has been one of the key policy items accentuated by all Finnish governments (Rouvinen and Pajarinen 2012, 47).

Measuring the innovation system in terms of investment in research and development and the proportion of high technology in the industrial production and exports puts Finland's innovation system among the best in the world (Suomi innovaatiotoiminnan kärkimaaksi 2005, 6). In fact, Florida (2007, 155) maintains that because of its dynamic and creative climate that has been built through investment in talent, utilization of technology, and increased effort to attract creative world-wide talent, Finland – with some other small countries – will be one of the future economic leaders of the world.

When comparing the financial resources directed towards research and development as a share of the total economic output, Finland ranks the third among the countries involved in the research. In terms of researchers per capita, Finland is the first. In terms of the innovative output, measured by patents granted per capita, Finland ranks the fourth. Combining these three measures together creates the global technology index, in which Finland takes the first place. (see Florida, Mellander and Stolarick 2011, pp. 4-6, 32-33) Figure 1 shows the global technology index in the form of a map to illustrate the situation worldwide.

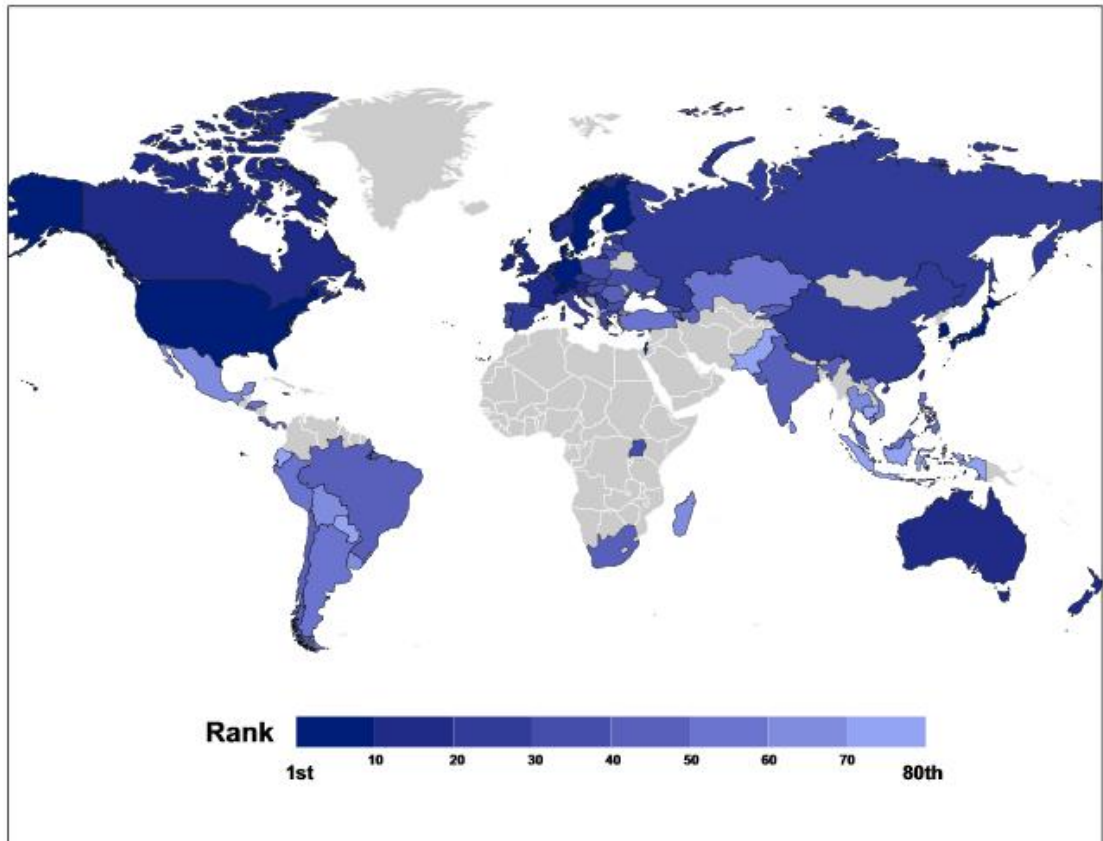


FIGURE 1. The Global Technology Map (Florida et al. 2011, 7).

In the comparison of human capital – measured by the proportion of the proper age group population that have attained tertiary level education – Finland ranks first among the countries involved in the research, with a percentage of 90.8. When looking at the creative class of a country – covering workers in areas such as technology, science, engineering, business, management, finance, design, architecture, arts, culture, entertainment, media, law, healthcare and education – it accounts for 43.4 percent of the workforce in Finland. In an international comparison, Finland ranks the 8th among the countries involved in the research. These two combined measures of human capital and creative class constitute an overall talent index, in which Finland has the leading position. (see Florida et al. 2011, pp. 7-10, 34-37) Figure 2 shows the global talent index in the form of a map to illustrate the situation worldwide.

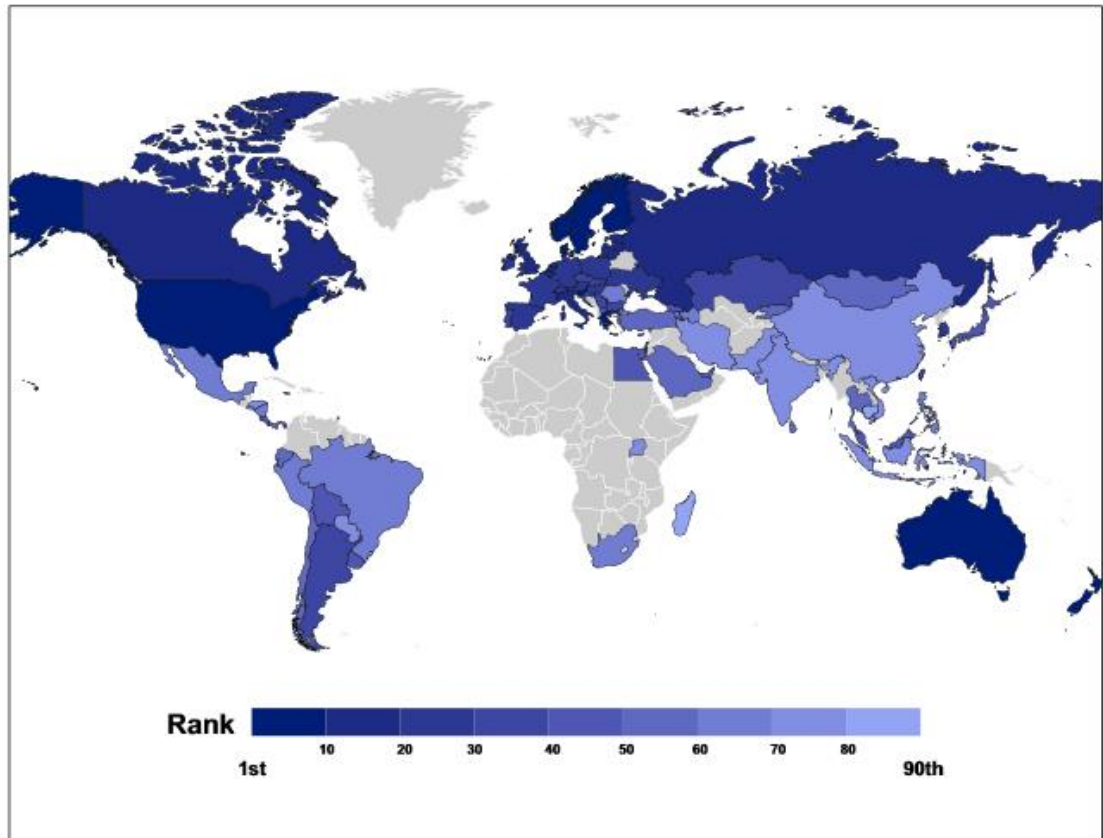
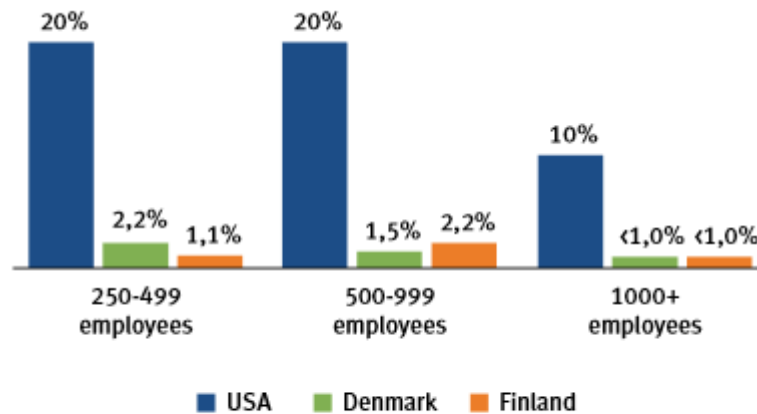


FIGURE 2. The Global Talent Map (Florida et al. 2011, 10).

However, *Suomi innovaatiotoiminnan kärkimaaksi* (2005) addresses “the paradox of Finland”: the country is competitive and skillful, but does not attract investments, is not at top positions in standard of living rankings and is not able to cut down unemployment. This paradox poses a threat to the competitiveness and affluence of the country. (p. 6)

Furthermore, even though the building blocks are seemingly in places, the country has – in general – difficulties with fostering young companies to grow large fast enough. In comparison to the USA where 10 percent of the companies with over 1000 employees are less than 9 years old, in Finland less than 1 percent of the companies with more than 1000 employees are less than 10 years old (Nordic Entrepreneurship Monitor 2010, 24). Furthermore, as Figure 3 illustrates, Finland has difficulties with growing new companies to the level of 250 employees in the first place.



Source: FORA, U.S. Census, Statistics Denmark and Statistics Finland.

FIGURE 3. The proportion of young firms (younger than 10 years old) that have grown from zero to 250, 500 or 1000 employees in the USA, Denmark and Finland (Nordic Entrepreneurship Monitor 2010, 25).

According to Kalmi (2013), there has been a discussion about Finnish products not being attractive: they simply do not appeal to customers and do not offer enough added value. Ruohonen (2007) provides several reasons for this lack of success. According to him, one reason is that there are not many disruptive or unique ideas in Finland. (p. 3) Korpelainen and Lampikoski (1997, 25) argue that the lack of innovativeness comes from the hidden potential in creativity and innovativeness being often left unutilized in many organizations, for reasons such as bureaucracy, short-term thinking, internal competition, stabilized practices, stabilized thinking and management culture. However, according to Solatie and Mäkeläinen (2009, 17), innovativeness and utilizing creativity are necessities in order for an enterprise to stay competitive.

Ruohonen (2007, 3) continues by saying that another reason for the lack of success stories lies on the Finnish attitude towards risk: they are risk-averse. According to Roland Xavier et al. (2013, 22), even though Finns perceive a lot of opportunities, they do not tend to believe in their capabilities. A research by Hyrsky and Tuunanen (1999) also concludes that Finns tend to be risk-averse, conservative and less innovative compared to Americans. However, according to Ruohonen (2007), in business – especially when aiming at high growth – risk-taking is essential in order to also obtain rewards. Because of their risk-averseness, Finns favor investing in “low

risk – low return” companies, avoiding cases that are disruptive in nature.

Furthermore, in Finland it is typical to expect to reap returns early on: growth is expected to be seen after two or three years. However, it is not usually possible for early-stage high-growth businesses to grow that fast. (pp. 3, 10)

Furthermore, Braconier (2012) addresses the concern of excessive employment protection legislation protecting employees on permanent contracts, which can adversely impact innovation. As the cost of failure is high, it may drive companies to focus on sustaining innovations rather than disruptive ones that can prove to be high-yielding in the long-term but that also have a larger element of risk involved. It can also lead inventors to choose not to commercialize their inventions in Finland or to sell them abroad at a rather early stage. Such examples of Finnish innovations are the operating system LINUX and the database system MySQL. (p. 16)

Moreover, it has been observed that the Finnish innovation system does not provide incentives for growth entrepreneurship: there is a risk that becoming an entrepreneur does not appear as a rewarding career option for highly educated, networked and talented people, who are willing and able to take risks and have often already built a successful career – the kind of people who typically make successful growth entrepreneurs. Furthermore, the generally prevailing conception is that entrepreneurship and risk-taking are not appreciated in Finland (Työ- ja elinkeinoministeriö 2010, 13-14). These are concerns that may, in part, explain the lack of Finnish success stories and the avoidance of risky ventures, which often are disruptive in nature.

1.3 Research Questions

The focus of this thesis lies on disruptive innovations. In order to shed light on the challenges faced by Finnish high-tech start-ups pursuing disruptive innovations, it is necessary to take a closer look at the topic. As there is no unambiguous classification available concerning which innovations can be categorized as disruptive for statistical purposes, it was not possible to find statistics concerning the amount of disruptive

innovations in Finland compared to the USA, for example. Therefore, it cannot be straightforwardly assumed that positive correlation between disruptive innovation and the ability for companies to grow large fast exists. However, it has been established that new ventures are expected to fail in launching sustaining innovations, but to succeed in launching disruptive innovations (see Raynor 2011, 3-5). Therefore, taking this into account and also the evidence that disruption can lead to high growth (see Christensen 2007), it cannot either be stated that there may not be any linkage between disruptive innovation and growth. In fact, this question – the existence of possible correlation between disruptive innovation and growth, and the strength of the correlation – would offer interesting grounds for further separate research. Moreover, taking into account the fact that the enterprise policy in Finland has moved towards supporting risky start-ups, and Tekes (the Finnish Funding Agency for Technology and Innovation) has moved its focus towards new ventures, disruptive innovation and internationalization (see Rouvinen and Pajarinen 2012, 51-52), it can be assumed that disruptive innovation – and the efforts to excel in it – will play a growing role among Finnish start-ups in the near future, and growth is expected to be created through it. This makes the topic of this research very timely and momentous.

In this research, the focus will be on Finnish high-tech start-ups and the challenges they face with pursuing disruptive innovations. The research questions are:

1. What are the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations?
2. How do these companies successfully overcome the challenges?

The objective of this research is to analyze the challenges of pursuing disruptive innovation from a company size perspective. A case study approach, complemented with an expert interview, will be followed. The theoretical framework for the research is based on Christensen's (2000) five principles of disruptive technology.

Christensen is the father of the concept of disruptive innovation, and the five principles lay out the logic of the phenomenon.

This research is expected to be of interest to any entrepreneurs and managers – not only to start-ups but also to established larger companies. It is hoped that this study will shed light on the challenges faced by Finnish high-tech start-ups pursuing disruptive innovations and will introduce tools to successfully overcome the challenges. It is also hoped that the research will aid established companies and their managers to gain a deeper understanding on the topic and serve as a platform for further thoughts. Moreover, it is aspired that also venture capitalists, policy makers and any other actors in the Finnish innovation system will find this thesis insightful in answering the determined questions.

This thesis will first examine disruptive innovation and prospects of success – and failure – in it. This thesis will then discuss the theoretical framework utilized and the methodology employed in the research process. Also the results of the empirical research are presented, after which they are reflected on the literature review conducted. Finally, after clearly answering the research questions, the research process is critically evaluated, recommendations derived from the research are discussed and suggestions for further research are presented.

2 EXCELLING IN DISRUPTIVE INNOVATION

In order to discuss disruptive innovation in an in-depth manner, it is necessary to begin with examining the concept of innovation in general. Webster's Reference Library English Dictionary (2005, 170) defines the word 'innovate' as "to introduce new methods, ideas, etc; to make changes". To explain the meaning it has in a business context, Kotler et al. (2002, 499) define innovation as "an idea, service, product or technology that has been developed and marketed to customers who perceive it as novel or new. It is a process of identifying, creating and delivering new-product or service values that did not exist before in the marketplace". Denning and

Dunham (2010, 6) define innovation as “the adoption of new practice in a community”, implying that innovation is only successful when an idea has been put into practice – in a business context, that is, has been *commercialized*. Invention, on the other hand, is defined as “the creation of new ideas, artifacts, processes, or methods” (Denning and Dunham 2010, 6), but it is not conditional to commercialization.

When discussing innovation, product development is another term often referred to. Kotler et al. (2002, 829) define product development as “developing the product concept into a physical product in order to ensure that the product idea can be turned into a workable product”. Lahtinen and Isoviita (1994, 90) define the same term as “a common name for all operations that aim at bringing either totally or partly new product alternatives onto the market”.

Christensen et al. (2004, 293) define disruptive innovation as follows:

An innovation that cannot be used by customers in mainstream markets. It defines a new performance trajectory by introducing new dimensions of performance compared to existing innovations. Disruptive innovations either create new markets by bringing new features to nonconsumers or offer more convenience or lower prices to customers at the low end of an existing market.

2.1 Why Do Market Leaders Eventually Fail?

In the discussion of disruptive innovations, it is of utmost importance to acknowledge the reasons that lead to the success of the disruptive innovations and, at the same time, to the failure of the major established businesses. Previous research conducted by Christensen (2000), at first on the innovations of disk drive industry and later applying the preliminary framework to several other industries, has enabled him to build a failure framework that explains why market-leading and excellently-managed companies eventually lose their position to an unknown and even new competitor.

Christensen (2000) makes a distinction between sustaining and disruptive technologies. Most new technologies in any industries are sustaining in nature. They

build on existing technologies, improving the performance of established products. They are additions to existing mainstream products that are favored by the majority of the customers in major markets. Disruptive technologies, on the other hand, do not emerge equally often – they are rare. Furthermore, at least at first, they offer worse product performance and are not generally valued by the mainstream customers. However, they often attract new type of customers by offering a whole new value proposition with typically cheaper, simpler and smaller products, and generally increasing the convenience of use. Over time, these disruptive technologies result in the failure of the current market leaders. (Christensen 2000)

Another element of the failure framework is the notion that technologies and market demand do not meet when companies over-develop their products. They aim at higher margins by trying to constantly create superior products due to the competition, which often leads to ‘overshooting’ the market – offering customers more than they need, and more importantly, more than they are willing to pay for. At the same time, disruptive technologies that may currently perform lower than what customers demand may be able to compete in the same market tomorrow with full performance-competence. (Christensen 2000)

Other professionals also recognize the fine line that determines the right amount of technological change. Ettlé (2006, 7) points out that technological changes usually fail if too much technology is adopted too quickly or not enough technology is changed and competitors get ahead. Furthermore, Morris (2009) makes a distinction between products that “are ‘makeable’ now, ‘makeable’ in the very near future, ‘makeable’ in the distant future, or just a distant dream”. Decisions concerning technology must be made – either to rely on the existing technology or to take risks and try some new technology. It can also be difficult to predict changes in technology and how fast the changes take place. (p. 54) Figure 4 summarizes the impact of sustaining and disruptive technological change.

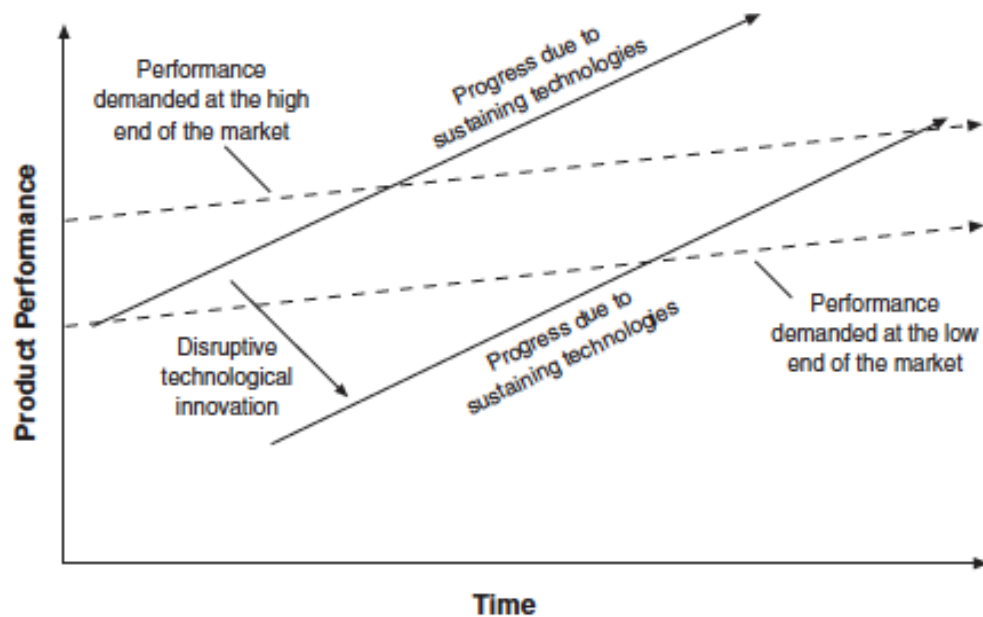


FIGURE 4. The Impact of Sustaining and Disruptive Technological Change (Christensen 2000, xix).

The third element of the failure framework is the notion that established companies do not tend to invest in disruptive technologies, as they generally offer lower margins and smaller profits, and are usually first introduced to emerging or otherwise insignificant markets. Furthermore, these disruptive technologies are not, in the beginning, generally wanted by the market leaders' most important customers. Therefore, as the majority of companies rely on listening to their best customers and seeking the highest profits and growth, they fail in noticing the importance of disruptive technologies until it is too late. (Christensen 2000)

According to Trott (2012), a recent research conducted by both Christensen (2003) and Hamel and Prahalad (1994) suggests that listening to customers may, in fact, have an adverse impact on technological innovation and have a negative effect on business success in the long term. To succeed in industries that are characterized by technological change, companies may actually have to focus on innovations that are not what their current customers want. (pp. 9-10) Therefore, rational management and decision-making that revolve around customers' needs may lead the boat away from the leadership position (Christensen 2000). Stefik and Stefik (2006, 15) support

this view arguing that, over time, a successful company becomes automated in its reactions and starts wearing “lenses” focusing on its customers, and therefore becomes unable to pay attention to the changing world. This pattern is extremely common.

Gallo (2010) refers to Steve Jobs who said that it is not possible to ask people what the next development or trend is going to be. He refers to Henry Ford’s legendary quote “If I’d have asked my customers what they wanted, they would have told me ‘A faster horse’”. (pp. 111-112) Furthermore, Whittington (2001, 79) refers to Brownlie (1987) stating that consumers do not know what is technologically feasible and are therefore not able to express their needs. This implies that customers are not aware of their future needs, as they do not know the possibilities. Therefore, according to Christensen (2000, 258), while paying close attention to customers’ needs is necessary in order to create sustaining innovations, it may, in fact, provide misleading information when dealing with disruptive innovations.

2.2 Low-End Disruption and New-Market Disruption

Disruptive innovations create new value and introduce new dimensions compared to existing innovations (Hautamäki 2008, 107). Disruptions can be further divided into two types: low-end disruption and new-market disruption. Low-end disruptions are innovations targeted to the least-profitable and most over served customers. New-market disruptions, on the other hand, are innovations that create a whole new value network by creating a new context of consumption and competition. (Christensen and Raynor 2003, 43-45) Figure 5 visually elaborates the difference between low-end disruption and new-market disruption.

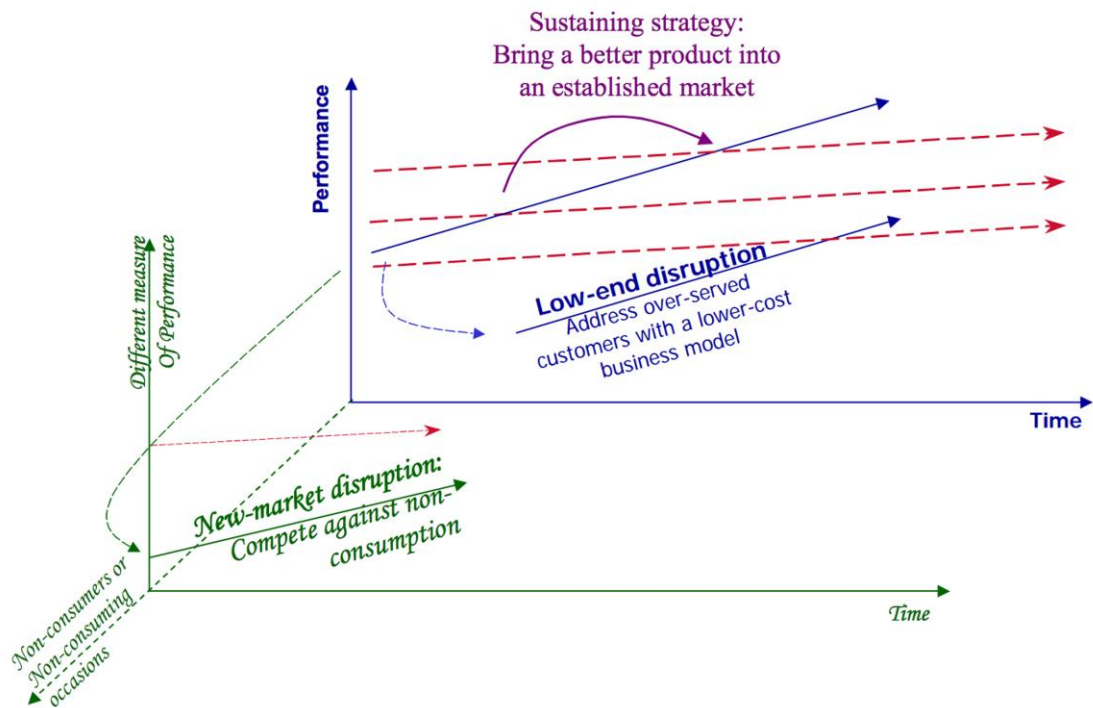


FIGURE 5. The Third Dimension of the Disruptive Innovation Model (Neota Logic 2013, referring to Christensen and Raynor 2003)

The biggest source of growth often lies on competing against non-consumption. By making the product affordable and simple, new-market disruption enables a new target market – who has not been able to own and use the product – to buy the product (Christensen and Raynor 2003; 45, 78). Prahalad (2006) compares the distribution of wealth in the world to a pyramid: at the top of the pyramid are the wealthy ones with opportunities to create more wealth, but at the bottom of the pyramid there are more than four billion people living with less than \$2 per day. This bottom of the pyramid, however, is significant: in some countries, the majority of the population is estimated to be at the bottom of the pyramid, therefore representing enormous new market potential (see Prahalad 2006).

Low-end disruptors achieve their success by targeting customers that the established large players are ignoring and not interested in (Christensen et al. 2004, 270). They are aimed at the least profitable and most over served customers. Examples of low-end disruption have been visible in retailing, for example, where discount retailers have been able to sell familiar products – such as toys, sporting goods and hardware – in lower prices by having less trained floor salespeople than in ordinary department

stores, as customers have felt confident in finding what they need themselves. This business model has enabled the low-cost stores to retain their profitability – only through a different approach. (Christensen and Raynor 2003, 45-47) These business model innovations mean that companies are able to offer their goods and services either more conveniently or at lower prices (Christensen et al. 2004, 270).

Christensen (2007, 18) clarifies that disruption is not just about technology, but what makes it powerful is the business model surrounding the technology, which allows the disruptor to be profitable at low price points or to form a completely different value chain, for example.

The common nominator in both low-end and new-market disruption is the notion that they are not competing with the existing major players: they are targeted towards either low-end customers or towards completely new markets, and do not therefore seemingly pose an immediate threat to the market leaders. That is why they are usually not recognized as competitors before it is too late.

2.3 Blue Ocean Strategy

When discussing disruptive innovations, it is inevitable to acknowledge that Blue Ocean Strategy has similarities with the principles of disruptive innovation. Therefore, it is relevant to address it in this context and reflect the concept of Blue Ocean Strategy on the concept of disruptive innovation.

Kim and Mauborgne (2005) point out that industries do not stay unchanged, but constantly evolve. There are changes in operations, markets and competitors. In order to become a future's winner, companies cannot compete with each other. In fact, they should not even try to compete. Instead, they should move their focus on somewhere completely else. (pp. 4, 6)

Kim and Mauborgne (2005) make a distinction between red oceans and blue oceans: red oceans representing today's existing industries and blue oceans representing the industries that do not exist – the unknown market space. Whereas red oceans are

characterized with jammed market space, limited prospects for profitability, industry boundaries and competitive rules, in blue oceans markets are still untapped and there is high potential to grow profitably. Furthermore, competitive rules are yet to be set, which makes the competition irrelevant. (pp. 4-5) In this context, blue oceans can be compared to disruptive innovations.

Most blue oceans are based on red oceans: existing industry boundaries are stretched. However, it is also possible to create new blue oceans from completely new grounds. (Kim and Mauborgne 2005, 5) In this context, basing blue oceans on red oceans by stretching industry boundaries can be compared to low-end disruption, whereas creating new oceans from completely new grounds can be compared to new-market disruption. This implies that Kim and Mauborgne's rationale supports Christensen's thesis, therefore mutually reinforcing both arguments.

Disruptive innovations in their essence are about doing something unlike. Porter (1996) has established that competing on operational effectiveness is not enough: to successfully obtain lead over competitors, one must be different. Kim and Mauborgne (2005, 6) argue that the focus of strategic thinking in general has been on red ocean strategies that rely on defeating the competition. This finding goes hand in hand with Christensen et al.'s (2004, 270) finding that most innovations are sustaining in nature. However, Kim and Mauborgne (2005, 6) maintain that the appearance and creation of new blue oceans is likely to increase in the future.

2.4 Adoption of Radical Innovations

At times, an industry can experience a disruption and "the rules of the game change". Lately, disruptions have been visible in banking, photography and music industries, for example. The banking industry has been overturned by telephone and internet banking, the photography industry has been revolutionized by the digital film, and the music industry is experiencing changes caused by downloading. These changes can be referred to as discontinuous, as they are very significant. (Trott 2012,

27) According to Moore (2003, 9), the changes are quoted as discontinuous, because – in addition to the changes required of the consumers – they require significant changes also of the supporting infrastructure. The change described can equally be referred to as disruptive, or as creative destruction, which is a concept created by Schumpeter (see Schumpeter 1942). Discontinuity can reframe the whole concept of an industry and people's perceptions of it: the shifts in technology, service and business model pose the challenge of discontinuous innovation and how to cope with it (Trott 2012, 28).

Morris (2009, 32) accentuates that the world is not anymore only about customers' needs, but it is also – increasingly – about their wants. Fulfilling customers' needs and wants is extremely challenging. Moore (2005, 4) defines the market as “a conservative institution” that opposes new changes and cherishes any currently prevailing state. Moreover, Fenn and Raskino (2008, 25) quote Eric Hoffer stating that “When people are free to do as they please, they usually imitate each other”. This implies that introducing new innovative products carries a high risk. It is estimated that between 65 to 75 percent of new products launched by established companies fail (Innosight 2012, 1). According to Gourville (2006), new products have failure rates between 40% and 90%, depending on the category. The products that are the most innovative and revolutionary also tend to perform unsatisfactorily: 47% of first-movers fail. (Gourville 2006) These figures imply that it is not possible to predict a definite success. Strategic decision-making is always limited as it is never possible to water-tightly anticipate the future state of the world and the probability distributions of the possible outcomes (Ståhle, Kyläheiko, Sandström and Virkkunen 2002, 182). Utterback (1994, 189-190) compares innovation to a game of chutes and ladders: “the player who encounters a break in the path will have his or her fortunes either rudely reversed or happily improved”.

A diffusion of disruptive innovations takes place when ‘innovators’ – the first people who adopt the new innovation – buy the new product and influence others so that they buy it (Price 2004, 39). The diffusion rates of innovations vary greatly and are mainly explained by five factors: relative advantage, compatibility, complexity,

trialability and observability (Tidd 2010, 20). According to Trott (2012, 71), radical innovations are not generally easily adopted in the market, as they represent new technology and new benefits that potential adopters find difficult to take in. Moreover, Christensen (2007, 18) maintains that when technology improves faster than people's lives change, it provides "too much performance for the average person". Furthermore, according to Veryzer (1998), when compared with less innovative products, discontinuous new products are difficult to evaluate due to lack of familiarity, 'irrationality', uncertainty, risk and compatibility issues (Trott 2012, 70).

What makes radical innovations risky is that adopting them often causes inconvenience to the users. Hautamäki (2008, 107) states that radical innovations are "enemies of the systems": while creating something new they also destroy the old technology. According to Gourville (2006), there is a trade-off involved when adopting new innovations. For example, when customers begin to drive electric cars, they gain a clean environment, but at the same time lose the easiness of refueling. Furthermore, consumers tend to place more weight on the losses they incur, as they are psychologically biased towards the products they currently possess and tend to overvalue them. At the same time, companies are biased towards their new products. This creates a clash of perspectives. (Gourville 2006)

Christensen (2007) also maintains that successful disruption requires trade-offs. It is not about being better in traditional measurements, but about being different. He names simplicity, convenience, accessibility and affordability as the cornerstones of disruptive innovation. However, he clarifies that disruption and different are not synonyms. Disruptions are not essentially about big technological breakthroughs, but more importantly about "mastering the intricate art of the simple solution". Therefore, disruptive innovations create growth by "redefining performance". (pp. 1, 18)

Boddy (2002) presents two underlying reasons for change in products: market pull and technology push. A market pull is caused by customers' new demands or

competitors' aim to change the strategic balance. A technology push, on the other hand, is initiated by an expert's idea of an innovation. Whereas a market pull usually includes a low risk and is likely to face demand, a technology push poses a high risk and often fails. With a technology push, consumers do not necessarily possess a need for the new product, as they have not been aware of its existence. However, if successful, it can lead to a total breakthrough innovation that changes "companies, industries and societies". (pp. 517-518) In this context, disruptive innovations can be compared to a technology push.

Marmer, Bjoern, Dogrultan and Berman (2011, 33) have come to the conclusion that most of the disruptive start-ups failing to validate if there is demand for their product will fail. This finding implies that the focus should be directed towards customers rather than the product itself. This notion is supported by Stevenson and Gumbert (1985), who argue that opportunity recognition should be about an external, market-oriented approach, rather than having the internal resources as a starting point. Gourville (2006) concludes that in order to maximize the value from the commercialization of an innovation, a company should aim to create significant product changes, but in a way that at the same time minimizes the need for consumers to change their behavior when using the new product. For consumers, the gains must outweigh the losses.

Furthermore, Christensen and Raynor (2003) make a distinction between the circumstances and the customer, stating that a product should be targeted at the *circumstances* where customers are, rather than towards the customers themselves. Generally, marketers tend to do market segmentation based on product type, price point, demographics and psychographics. However, more important than to focus on these attributes of products and customers is to understand the circumstances that customers are in when they buy or use a product; customers have "jobs" that need to get done, and are on the lookout for products that help them to get those jobs done. According to them, this approach predicts success. (Christensen and Raynor 2003, 75)

2.5 Prospects for Success

The connective factor in the literature regarding disruptive innovation is that there is always an element of risk present and success is never a given. However, by comprehensively understanding the patterns that lead to success and failure can have an enormous effect on the capability of entrepreneurs to innovate (Marmer, Bjoern & Berman 2011, 3). Therefore, in order to select the most optimal approach to pursue, it is crucial to understand the implications that different approaches on innovation can have on predicted success of the business. According to Bragg and Bragg (2005), the higher the degree of innovation, the higher the risk. However, they also acknowledge that products that simply copy existing ones and lack any innovation can pose an equal risk. (p. 184)

According to Christensen et al. (2004), the established players typically have advantage in sustaining innovations. They state that “an entrant with a sustaining innovation has a low likelihood of success if it attempts to build a substantial business around the innovation”. (pp. 270-271) Furthermore, Blank (2007, 135) maintains that the dominance of competitors in existing markets and the cost of entry, such as costs of sales and marketing, should not be ignored by start-ups.

According to Raynor (2011), disruption theory can be used to predict the survival of new ventures. Established players – incumbents – are expected to succeed in launching sustaining innovations, but expected to fail if they launch disruptive innovations to their own markets. In contrary, new entrants are expected to fail in launching sustaining innovations, but expected to succeed in launching disruptive innovations (pp. 3-5). Furthermore, Christensen and Raynor (2003, 117) emphasize that disruption makes competitors disinterested. After all, they usually have their focus on serving the most profitable mainstream markets and tend to neglect disruptive innovations, which are the ones that will become ‘tomorrow’s success stories’. Figure 6 summarizes the implications of disruption theory on new venture success.

Market Status	Entrant	Fail	Succeed
	Incumbent	Succeed	Fail
		Sustaining	Disruptive
		Innovative Strategy	

FIGURE 6. The implications of disruption theory on new venture success (Raynor 2011, 4).

Huang (2010) refers to Thurston, stating that for a new entrant, the worst strategy is to pursue sustaining innovations, as it is extremely likely to lead to failure. A new entrant with a disruptive strategy has between 30 to 40 percent better changes to survive compared to a new entrant with a sustaining strategy. (Huang 2010) This viewpoint is in line with Christensen et al.'s (2004) and Raynor's (2011) findings.

Also Marmer, Bjoern, Dogrultan and Berman (2011, 4) maintain that "startups thrive on creating disruptive innovations". According to them, start-ups have an extremely high failure rate: 90 percent. The high failure rate can be largely explained by the finding that 70 percent of start-ups fall for premature scaling. Premature scaling means developing one dimension – product, team, business model, or financials – inconsistently with the customer dimension. For example, this may mean adding unnecessary extra features on the product or aiming to scale up too early on. (Marmer, Bjoern, Dogrultan & Berman 2011, 10-11) This conclusion also supports the viewpoint that start-ups perform better when concentrating on disruptive innovations, without making the product too complicated, but rather creating value through introducing something utterly different. Christensen et al.'s (2004) findings

further build on this viewpoint. According to them, a common mistake that companies make with disruptive innovations is that they try to vigorously introduce them to the mainstream market. However, as the disruptive product typically is simple and has limitations in terms of performance, the mainstream market is not initially interested in it. The key is to avoid going after that mainstream market and modify the product to match their needs – after all, this kind of attempt will almost certainly fail. (p. 270)

Moreover, Huang (2010) refers to Thurston, who maintains that most start-ups fail because they claim to be “cheaper and better”. Claiming to be better will provoke competition and large established companies will aggressively respond. Therefore, if a start-up does not pose a visible threat to incumbents at the early stage, it gains an opportunity to grow market share and improve performance before the competition intensifies, which will increase its likelihood of success. (Huang 2010)

2.6 Five Principles of Disruptive Technology

To find common nominators for the underlying reasons to engage in disruptive innovation and to see its benefits from a start-up’s point of view, Christensen (2000) proposed five principles of disruptive technology that form the most optimal framework for that purpose. He emphasizes the strength of these laws and underlines the importance of managers to understand them rather than fight against them in order to successfully manage when coming face-to-face with disruptive technological change in an industry. (Christensen 2000) This framework is used as the main theoretical framework for this thesis.

1. Companies Depend on Customers and Investors for Resources

The first principle is that “companies depend on customers and investors for resources”: to stay alive, they need to give them what they want and “kill” any ideas that do not fit into this equation. In fact, the highest-performing companies are excellent at “killing” any unsuited ideas that are not in tone with their most profitable customers and investors. However, as a result, this makes it difficult for

companies to invest in lower-margin disruptive technologies until their customers start demanding them. At that stage, however, it is already too late. (Christensen 2000, xxiii-xxiv)

2. Small Markets Don't Solve the Growth Needs of Large Companies

The second principle is that “small markets don't solve the growth needs of large companies”: the larger the company, the larger are the profits needed in order to create growth. Therefore, small or emerging markets – where disruptive technologies typically are aimed at initially – are not attractive to large companies, leaving smaller competitors to gain the important first-mover advantages. In fact, many large organizations tend to wait until new markets have grown enough “to be interesting”. However, at that stage it is too late. (Christensen 2000, xxiv-xxv)

According to Christensen (2000), in disruptive technologies, there are powerful barriers to entry and mobility. However, they are different from those barriers that have been defined by economists (see Porter 2008). According to Christensen (2000), the earlier definitions relate to assets or resources hard to obtain or replicate, whereas his focus is on the fact that for market leaders focusing on disruptive technologies just simply does not make sense and is against rational management thinking to invest in them. Therefore, when small firms build the new markets for disruptive technologies, they gain significant protection from the matter that doing the same would not make sense for the established leading companies to do. This is perhaps the most powerful protection. (Christensen 2000, 260-261)

3. Markets That Don't Exist Can't Be Analyzed

The third principle is that “markets that don't exist can't be analyzed”. After all, good management usually means market research and thorough planning, which are suitable practices when dealing with sustaining innovations. However, with disruptive innovations, the same rules do not apply: the markets are not known and market data does not exist. Therefore, in discovery-based planning, the focus should be on learning what needs to be known and accepting that forecasts and chosen strategies can be wrong. (Christensen 2000, xxv-xxvi) Failure and iterative learning

are the cornerstones of success in disruptive innovations. The tolerance of failure, however, is something that successful organizations struggle with. (Christensen 2000, 260) However, Ries' (2010) definition of start-ups emphasizes the uncertain conditions of the start-up environment (see Ries 2010). Taking into account the necessity of start-ups to be able to cope with uncertainty, it may be another reason why start-ups should focus on disruptive innovations.

Innovation has an opportunity cost: the necessity of change. Most people tend to favor predictability and routines. (Stevenson and Gumbert 1985) Moore (2002, 120-121) maintains that for an entrepreneur to pursue disruptive innovation, it is of utmost importance to have a solid faith in the business model belittled by others. Moreover, Christensen (2000) states that even though ideas involving disruptive technologies often die, creating new markets for disruptive technologies does not necessarily have to involve a high risk. In fact, managers who utilize the iterative process of learning – who try, fail, learn quickly and try again – can gain a deep understanding of the customers, markets and technologies needed in order to commercialize disruptive innovations successfully. (p. 260)

4. An Organization's Capabilities Define Its Disabilities

The fourth principle is that "an organization's capabilities define its disabilities": managers are not able to distinguish between the capabilities of the people and those of the organization, which are separate from each other. An organization's capabilities are found in its processes and values, and they are not as flexible as people. (Christensen 2000, xxvi-xxvii) Capabilities of an organization are an issue often unacknowledged, though it can become visible if two identical sets of people work in two different organizations: the results achieved are likely to be different. Therefore, in addition to concentrating on the people, managers must also nurture the organization itself – its resources, processes and values. (Christensen 2000, 185-188)

5. Technology Supply May Not Equal Market Demand

The fifth principle is that “technology supply may not equal market demand”.

Disruptive technologies are, at first, only used by small markets, but in time they can fully compete with established products in terms of performance in mainstream markets. This takes place as technological development in products is faster than what mainstream customers ask for or can take in. Market-matching products of today tend to ‘overshoot’ the market needs tomorrow, whereas today’s underperforming products may be performance-competitive tomorrow. By oversatisfying the customers’ needs in hopes of higher margins, these companies create a vacuum at lower price points enabling competitors with disruptive technologies to emerge. (Christensen 2000, xxvii-xxviii)

These five principles of disruptive technology offer solid grounds for understanding the logic of disruptive innovations. Reflected against these statements, it is possible to explore the challenges faced by Finnish high-tech start-ups when pursuing disruptive innovations: the challenges of creating disruptive innovations and the challenges of successfully commercializing them.

3 METHODOLOGY

To identify the major challenges that Finnish high-tech start-ups face in pursuing disruptive innovations, and how to tackle those challenges, is a multi-faceted query. As the reviewed literature reveals, there are more or less generally known challenges, such as risk-averseness, the complexity of the Finnish innovation system, lack of incentives for growth entrepreneurship and the notion that creativeness is often left unutilized. However, it is unlikely that these are the only factors explaining the major obstacles. Therefore, to dig deeper in this field and to try to produce new meaningful information and fresh insights, approaching the topic from a different viewpoint and looking for less-known and less expected explanations for the challenges is required. This is where Christensen’s (2000) five principles of disruptive technology step in.

Christensen's (2000) five principles of disruptive technology were used as the main theoretical framework for this thesis. Christensen (2000) emphasizes the strength of the principles and that managers understand them. The presupposition of the author was that there could be lack of acknowledgement of these principles among Finnish start-ups, which may cause challenges.

The research questions are:

1. What are the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations?
2. How do these companies successfully overcome the challenges?

A qualitative research approach was selected for this research. As qualitative research examines narrative data (Wilson 2010, 13) and relates to interpretation and understanding (Eriksson and Kovalainen 2008, 5), it was decided to be the most optimal choice for seeking answers to the research questions.

The research strategy selected was to conduct an expert interview and a case study. At first, a professional from the topic field was interviewed in order to gain information on the challenges faced by Finnish high-tech start-ups pursuing disruptive innovations in general and also to obtain suggestions concerning suitable companies for the case study. The case study consisted of a documentary analysis of the case company and an interview with an establishing member of the case company. Because of the nature of the research questions and the need to gain deep insights, case study was selected as the research strategy. According to Rowley (2002), case study approach enables a deep, detailed investigation and suits particularly well to providing answers to how and why questions. Furthermore, case studies can result to insights that might not have been reached with other strategies. (pp. 16-17)

The original plan was to undertake a case study of two Finnish high-tech companies that have commenced as start-ups and have successfully commercialized a disruptive innovation. However, due to the small number of truly disruptive companies in Finland, it turned out more difficult than expected to find two companies willing to take part into the study. Therefore, a decision was made to conduct a single case study. Even though a single case study cannot be viewed as generalizable, it was decided as one of the methods – in addition to the expert interview – to seek answers for the set research questions. Case studies do not always aim to produce a representative sample: in fact, to pursue that, case study is not the optimal method (Siggelkow 2007, 20-21). Furthermore, “it is often desirable to choose a particular organization precisely because it is very special in the sense of allowing one to gain certain insights that other organizations would not be able to provide” (Siggelkow 2007, 20). In this case, the value of the case company as a specific example of a Finnish high-tech start-up that has successfully commercialized a disruptive innovation weighted more heavily on the scales than the lack of generalizability of the study.

Figure 7 illustrates the research strategy – the general plan of answering the research questions (Saunders, Lewis and Thornhill 2009, 600) – of this study in a simplified manner.

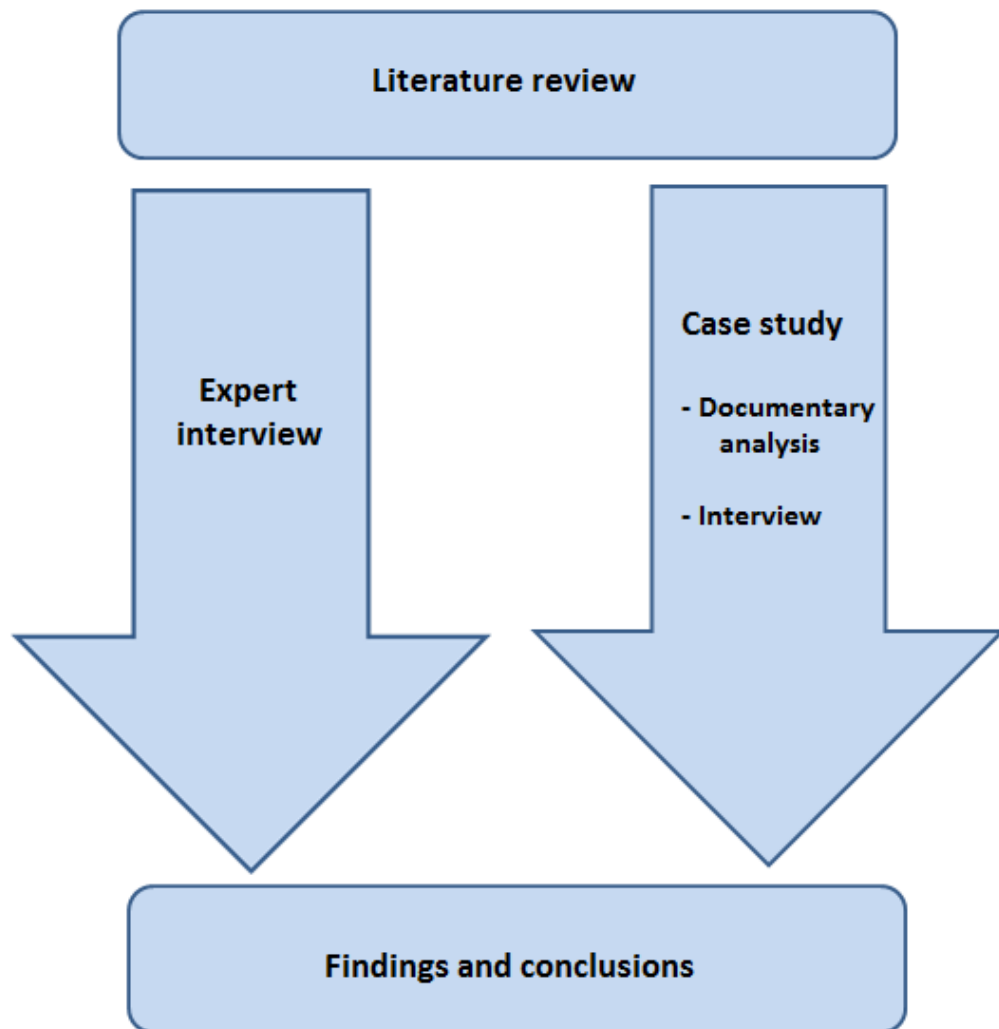


FIGURE 7. The research strategy.

3.1 Expert Interview: Utilizing Knowledge of a Professional

Preparatory to the case study, an expert was interviewed. This was expected to provide further insights into the challenges faced by Finnish high-tech start-ups pursuing disruptive innovations in general. The preliminary plan was to conduct two expert interviews, for which two experts from the field of Finnish high-tech start-ups were contacted. However, both of them stated that Director Tuomas Maisala from Spinno Enterprise Center would be the optimal person to be interviewed due to his extensive experience in the field of Finnish high-tech start-ups. Therefore, he was contacted by email in order to find out if he was willing to be interviewed for this research, and he agreed. Because of the solid and unanimous recommendations by the two other experts concerning Maisala's expertise, it was decided that it is not

necessary to seek other experts for an interview, as Maisala definitely seemed to be the right person to talk to with regards to this specific subject matter.

The interview took place on Friday, 30 August 2013 at 9:30 a.m. via Skype. It was an hour-long conversation. The questions were sent to the interviewee in advance to give him an option to go through the themes of the discussion beforehand. However, the purpose was not to rigidly follow a set list of questions, but to conduct a semi-structured interview – “-- in which the interviewer commences with a set of interview themes but is prepared to vary the order in which questions are asked and to ask new questions in the context of the research situation” (Saunders et al. 2009, 601) – in order to maintain more flexibility and to focus on the issues that seemed meaningful. Semi-structured interviews are especially suitable when trying to interpretatively understand the meanings that interviewees ascribe to the specific phenomena (Saunders et al. 2009, 324). Therefore, that was the choice behind the interview structure.

The interview was held in Finnish, which is the native language of both the interviewer and the interviewee. Finnish was chosen as the language for communication in order to avoid any misunderstanding or loss of meaning, and to provide the most optimal conditions for a deep conversation.

With the permission of the interviewee, the interview was recorded. A voice recorder of a Samsung Galaxy smart phone was used to record the conversation. After the interview, a transcript of the conversation was written by replaying the recorded file. This provided an opportunity to obtain optimal accuracy of the answers, and to analyze the responses without the danger of subconsciously relying on the interviewer’s own, possibly biased notes or preconceptions.

3.2 Case Study: A Quest to Dig Deep

Because of the nature of the research questions, it was necessary to dig deep into the topic. Therefore, a case study was conducted. According to Robson (2007, 27),

case studies have the benefits of going deep and interpreting complex issues, relationships and processes.

Yin (1994, 13) defines case study as follows: “A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. The case can be anything between an individual to a global event (Robson 2007, 26). In this case, the objective of this research was to analyze the challenges of pursuing disruptive innovation from a company size perspective.

The importance of constructing validity in case study research is emphasized. In order to increase the construct validity, multiple sources of evidence in data collection should be used (Yin 1994, 34). Therefore, this research was implemented as a multi-method qualitative study, which means employing more than one qualitative data collection technique (Saunders et al. 2009, 152). The main data collection method employed was interview, and documentary analysis was also utilized.

3.2.1 The Case Company

The original plan was to undertake a case study by analyzing two Finnish high-tech companies that have commenced as start-ups and have successfully commercialized a disruptive innovation. However, due to the small number of truly disruptive companies in Finland, it turned out more difficult than expected to find the two companies willing to take part into the study. Thankfully, one disruptive company willing to be interviewed was found. Despite the difficulties encountered with finding case companies, it was decided not to study cases from other countries such as the USA; going beyond Finnish borders would have probably enabled a multiple case study, but it would have also drifted the focus away from the Finnish high-tech start-ups. As the purpose of this study specifically was to identify challenges faced by Finnish high-tech start-ups pursuing disruptive innovations and how they successfully overcome the challenges, investigating challenges faced by foreign high-tech start-

ups would have changed the nature of this study. Therefore, to maintain the specific focus of this study, it was decided to keep the focus on Finnish high-tech start-ups.

When discussing start-ups, it is relevant to define the term. When referring to a start-up, there is no one and only correct definition that alone sufficiently and exhaustively describes the word. Therefore, a couple of the most well-known and timely definitions of the word are referred to. According to Blank (2010), “a startup is an organization formed to search for a repeatable and scalable business model”. Furthermore, quoting Ries (2010), “a startup is a human institution designed to deliver a new product or service under conditions of extreme uncertainty”. In contrast, when defining an established company, Oxford Advanced Learner’s Dictionary of Current English (2000, 426) define the word ‘established’ as “respected or given official status because it has existed or been used for a long time”.

It was the request of the interviewed member of the management of the case company to take part into this research anonymously. Therefore, the case company will be referred to as ‘Company X’. Company X engages in high-tech directed to industry. The industrial sector is an old, traditional industry, which new technology is being created for.

Company X fits into the description of small and medium sized enterprises. Small and medium sized enterprises are often referred to as SMEs. They are enterprises that have less than 250 paid employees and either have an annual turnover not more than EUR 50 million or a balance sheet total not more than EUR 43 million, and which correspond to the criterion of independence defined under section 3 of the definition (see Statistics Finland n.d.).

3.2.2 Documentary Analysis

To learn about the case company, a comprehensive documentary analysis was conducted, in which documentary secondary data was examined. Documentary

secondary data can include both written and non-written materials (Saunders et al. 2009, 258).

In this research, the documentary data utilized consist of both written and non-written materials – anything that was publicly available information. In practice, this included the company website and other internet sources such as videos, interviews, articles and news.

3.2.3 Interview with the Case Company

The main data collection method for the case study was an interview with one of the establishing members of the case company. According to Eisenhardt and Graebner (2007, 28), interviews enable efficient collection of fruitful empirical data. The interview was chosen as the main data collection method in order to gain a practical view and understanding of the challenges that the case company has faced in pursuing disruptive innovation and of how it has successfully overcome those challenges.

A member of the founding team of Company X – who still holds a managerial position in the same company – was contacted. He was considered to be the right person to talk to, as he has seen the company's first steps as a start-up and witnessed its growth into a successful business. He was contacted by email and was willing to be interviewed.

The hour-long interview was held on Thursday, 5 September 2013 at 5:00 p.m. via Skype. The questions were sent to the interviewee in advance to give him a chance to familiarize himself with the themes of the discussion beforehand. Nevertheless, the purpose was again not to strictly follow the set list of questions, but to hold a semi-structured interview: to go through certain pre-planned questions, but to focus on the areas that seemed most important and meaningful.

In order to enable an optimal, deep flow of conversation and to avoid misunderstanding or any loss of information, the interview was conducted in Finnish, as it is the native language of both the interviewer and the interviewee.

The interview was recorded with the permission of the interviewee. The voice recorder of a Samsung Galaxy smart phone was used to record the conversation, and after the interview, a transcript of the conversation was written by replaying the recorded file. This provided an opportunity to obtain as accurate answers as possible, and to analyze the responses without the danger of subconsciously relying on the interviewer's own, possibly biased notes or preconceptions.

3.3 Reliability and Validity

The quality of the research is largely judged by its reliability and validity. Therefore, these are issues that must be acknowledged and cherished throughout the longitude of the research process. Moreover, it is of utmost importance to have an in-depth discussion of reliability and validity of the research findings: whether reliability and validity were achieved, and which issues positively or negatively affected it.

According to Saunders et al. (2009, 156), "reliability refers to the extent to which your data collection techniques or analysis procedures will yield consistent findings". Hammersley (1992, 67) defines reliability as "the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions". In other words, reliability refers to replicability (Silverman 2006, 282).

Robson (2007) states that when there are people involved, it is not quite possible in practice to get a perfectly identical repetition of the results. Especially with qualitative data and flexible research designs, it can be questionable how strong reliability is possible to be achieved. However, there are methods that can be employed to increase the reliability of the research findings, such as triangulation, which means using multiple data collection methods. (pp. 71-72) Triangulation allows

the inspection of the research question from different angles (Davies 2007, 243). As discussed earlier on in this thesis, this research was implemented as a multi-method qualitative study, collecting data by utilizing multiple data collection methods: interviews and a documentary analysis. This approach – that can also be described as triangulation – was employed in order to increase the reliability of the findings.

According to Saunders et al. (2009, 157), “validity is concerned with whether the findings are really about what they appear to be about”. Hammersley (1990, 57) defines validity as “the extent to which an account accurately represents the social phenomena to which it refers”. Furthermore, according to Silverman (2005, 210), validity parallels truth. According to Saunders et al. (2009), with case studies, especially if conducting a case study of one company, there may be a worry concerning the external validity of the findings: whether and to which extent the research findings are generalizable to apply in other research settings, such as in other companies. In case studies of one or few companies, it is neither possible to present the findings as generalizable, nor to build theories or draw conclusions that can be claimed to be generalizable. However, that does not pose a problem as long as the author does not claim the study to be generalizable. (p. 158) Internal validity, on the other hand, is concerned with “establishing a causal relationship whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships” (Rowley 2002, 20). Therefore, internal validity is concerned with the factors inside the research, and whether the research was conducted in a correct manner. As there was not any disturbance or any other questionable factors present in the study, the internal validity of this research conducted can be stated to be high.

As this case study involved one company only, it must be acknowledged and underlined that the results derived from this study cannot be generalized to be applicable in other settings or in every case; it cannot be assumed that fully similar answers would be obtained was the study repeated with another case company. However, adding into account the expert interview conducted with Mr. Maisala – who has been advising and coaching Finnish high-tech start-ups for over a decade

and has dealt with hundreds of start-up teams – it can be stated that by virtue of his broad and extensive knowledge of this subject matter, the validity is positively affected. However, it must be recognized that when interviewing any single person, the opinions and comments given by him are just reflections of one individual and cannot therefore be treated as highly generalizable, even though the person's expertise of the subject matter naturally increases the value of the information obtained from him. However, the fact that the findings obtained from both the case study and the expert interview were largely similar, they can be seen as mutually reinforcing, which is a positive indicator concerning the reliability and validity of the findings.

It is also relevant to evaluate the interview as a data collection method, and its effect on the reliability and validity of the findings obtained. With interviews there is a risk that the data collected are biased (Eisenhardt and Graebner 2007, 28). However, in this case there was not so much of a risk of the interviewees being biased; the larger risk was probably the lack of experience of the researcher as an interviewer and that answers could have been subconsciously heard in a biased way. However, the fact that this possible problem was acknowledged had a positive effect on ensuring the truthfulness of the data collected. Therefore, the interviews were recorded, based on which transcripts of the conversations were written. This was done in order to ensure the optimal accuracy of the answers and to avoid the danger of subconsciously relying on the researcher's own, possibly biased notes or preconceptions. It can be stated that these factors had a positive effect on reducing the danger of bias.

In addition to evaluating the interview as a data collection method, it is consistent to discuss the documentary analysis as a data collection method and its impact on the reliability and validity of the findings obtained. According to Robson (2007), a major concern linked to documentary analysis is the possible bias, as the documents have been produced for different purposes. Therefore, it is likely that they are biased towards their actual purpose for what they were originally produced for. (pp. 29, 88-89) The author was aware of this concern, which provided healthy grounds for

critical review of the documents and their credibility. When inspecting the documents, every document and the source of it were analyzed in terms of their credibility and the purpose of production, and these matters were taken into account when viewing the information or drawing any conclusions based on it. Any doubtful source or document was omitted.

Moreover, it is significant to evaluate the reliability and validity of the literature review conducted for the theoretical part of this thesis. Again, it is crucial to recognize the possible bias of the sources used. Therefore, to ensure the optimal quality of the sources employed, books by acknowledged, well-respected authors or publishers and articles of academic background were utilized. Furthermore, website sources used were assessed based on the publisher or the organization behind the information, leaving any suspicious sources out. In short, the information utilized was carefully selected, exercising cautiousness and following sound research ethics.

To evaluate the broadness and diverseness of the literature review, it must be stated that the main theoretical framework relies quite heavily on Clayton M. Christensen. However, that can be deemed as applicable, as Christensen is renowned as the father of the concept of disruptive innovation. However, other contributors have also been utilized abundantly throughout this thesis work, which secures the inspection of the topic from different angles. It can be seen from the references section that the literature review conducted has been extensive and thorough. This also positively affects the reliability and validity of the research as a whole.

4 RESULTS

The results of the empirical study conducted are presented in this chapter. The findings from the expert interview complement the case study undertaken, together painting a clear picture of the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations and how to face them successfully.

4.1 Results of the Expert Interview

Director Tuomas Maisala of Spinno Enterprise Center is specialized in start-up financing and general management, and the industries of Internet & media, telecom and professional services (Spinno Enterprise Center n.d. a). Spinno Enterprise Center offers internationally competitive and recognized pre-incubation and incubation programs directed to technology and knowledge based start-ups aspiring to grow fast and achieve international success. Spinno has development programs for high-tech and knowledge-based companies, and offer advisory services, practical training and networking events for new growth start-ups in Finland. (Spinno Enterprise Center n.d. b) Maisala has been advising and coaching Finnish high-tech start-ups since 2001, and has experience in dealing with hundreds of start-up teams.

The interview questions can be viewed in the appendices. However, as explained, the interview was semi-structured and the list of questions was not rigidly followed. Furthermore, the original questions were in Finnish, as the interview was held in Finnish. Therefore, the list of questions was translated into English.

According to Maisala, only a small minority proportion of start-ups are truly radical innovations. He estimates that from their customer flow, approximately 10 percent of start-ups have characteristics of a radical innovation, whereas 90 percent of start-ups have rather conventional ideas. Figure 8 visually illustrates the rarity of start-ups with characteristics of disruptive innovations compared to start-ups with sustaining ones.

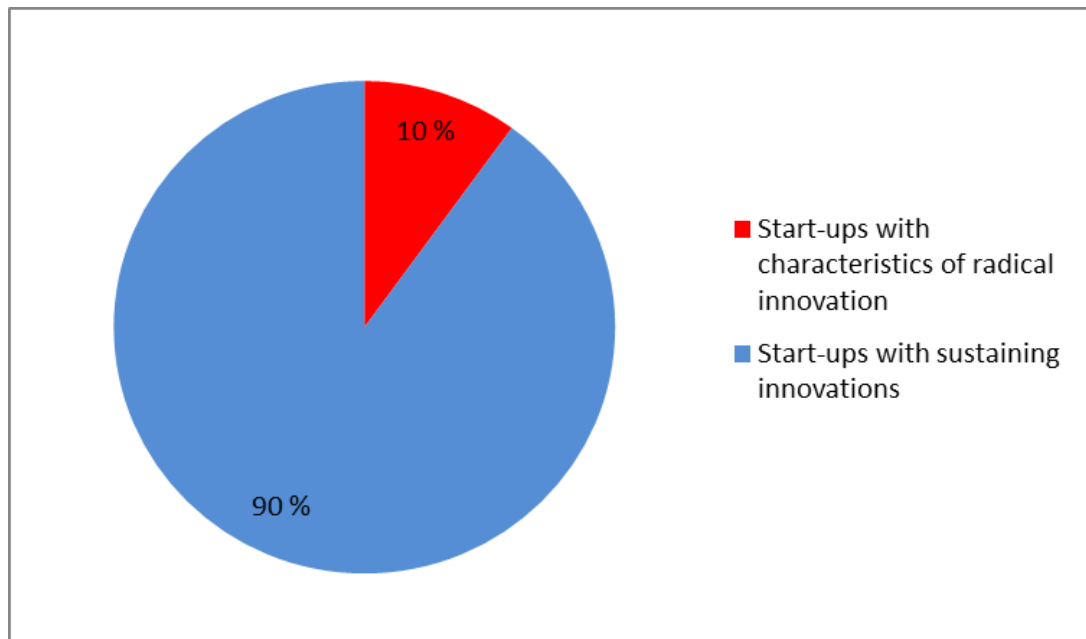


FIGURE 8. Existence of start-ups with characteristics of a radical innovation (according to an estimation provided by Maisala).

According to Maisala's experience, radical innovations always take more time and never grow as fast as the entrepreneurs had originally expected. He sees that radical innovations usually have the potential for a higher growth, but at the same time one must create markets that do not readily exist, which is why many of them drop out during the journey as they do not achieve success. According to him, the success in disruptive innovations is rare, but when it takes place, the private equity investors usually get their money back and significant companies are born, whereas with incremental innovations, it is easier to achieve a turnover of approximately one million euros but the growth often stops there because there are similar companies on the market already. Thus, it is not easy to turn the venture into an international breakthrough.

When discussing the funding of innovations, Maisala sees that the availability of funding for start-ups that create disruptive innovations is better than for start-ups with sustaining innovations: "At least in principle, both public and private sector are more interested in radical innovations, as there is potential for large growth". Furthermore, he says that a start-up with disruptive innovation usually owns some unique Intellectual Property Rights.

As for the Finnish innovation system, Maisala states that from the point of view of funding and supply, funding is very well focused towards start-ups with disruptive innovations and the high risk is well understood and tolerated. He says that disruptive innovation usually takes more time than originally expected – more than an ordinary start-up – which requires patience of the investors. There are challenges in technical development towards a real product, and it takes time to gain customers and to convince them of the new solution. According to Maisala, the public sector such as Tekes (the Finnish Funding Agency for Technology and Innovation) stretches to this very well: “If they see that a company has gone forward, it is usually possible to obtain more funding”. However, he states that private equity investors may be less patient, as they may have more pressure of their money concerning the funding period and they cannot be equally flexible.

Regarding other aspects of the Finnish innovation system, the conversation suggested that there could be room for improvement among some initial financiers in recognizing radical innovations, and that funding should be more focused towards radical innovations invented by private people. According to Maisala, the challenge sometimes initially faced with start-ups with disruptive innovations is that the financiers only have certain instruments to utilize, but disruptive start-ups would probably need larger funding faster.

When discussing the incentives for growth entrepreneurship in Finland and whether they apply to start-ups with disruptive innovations, Maisala sees – if estimating the funding from Tekes that aims to solve the commercialization and growth of new innovations – that Tekes estimates the business potential, regardless of the innovation being radical or sustaining in nature. However, he raises the question of us being able to estimate business potential correctly. He gives an example of an industry where competition is hard: the competitive advantage is not based on a radically different way of solving the problem, but instead the execution is better and more effective than that of the competitors, and that is when the meaning of the team comes more visible. According to him, Tekes and private equity investors have

a good picture of the fact that also radical innovations require a team. Innovation alone is not enough to commercialize, which makes a team necessary. According to Maisala, a dream case for financiers and investors is that “there is a good experienced team that has experience from business and start-up knowledge and there would be a unique technological innovation that could be patented”. According to him, all investors hope for a tenfold improvement in terms of efficiency or time spent: these are the ones that can become large businesses. However, he states that with radical innovations it may be harder to estimate the potential when the market does not readily exist. Even if the team is good and there are good Intellectual Property Rights, it is crucial to think far enough whether there is need and demand for the innovation. Figure 9 summarizes the elements that a start-up should ideally have in order to attract investment.

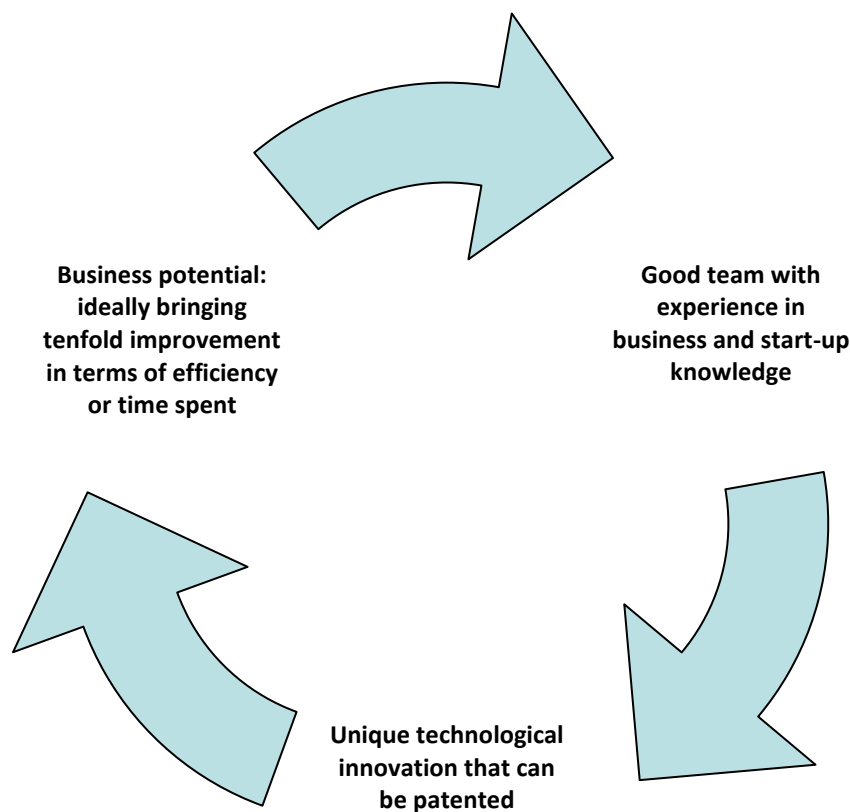


FIGURE 9. The elements that a start-up should ideally have in order to attract investment (according to Maisala).

When discussing the growth expectations of disruptive start-ups, Maisala states that an ordinary start-up is more likely to become a small or medium sized company and to achieve a turnover of few millions. He says that with disruptive innovation it is probably more difficult to reach that point: more of them fail before obtaining any meaningful turnover. For example, there can be technology developed but it is not possible to apply it in business and there are no customers for the solution. It is very rare to get past this stage and according to Maisala, the road can be long: the products where radical technology is utilized can be ten years ahead in the future. Therefore, he states that “the timescale [for radical innovations] is longer, but if they achieve breakthrough then the growth or growth expectations are usually considerably higher”.

According to Maisala, it is not typical to aim disruptive high-tech innovations towards low-end markets. According to his experience, the majority of Finnish high-tech start-ups pursuing disruptive innovations targets a narrow market segment with premium-typed pricing. He says that there have been suggestions concerning disruptive innovations for low-end markets, but most of them have not been realized as technology expenses have been so high that it would not have been possible to turn them into mass-market products.

Concerning the marketing of disruptive innovations, Maisala states that it differs from sustaining innovations. According to him, with disruptive high-tech innovations, there is usually need to tell more about the technological innovation and the solution, as it usually requires some learning of the customer or the consumer. He sees that if one's business is based on providing a solution to an existing issue that is already on the market but in a more efficient way, it may be cheaper; it is easier to communicate the solution as it is possible to reach the existing market and there are existing players and pricing principles. He says that some high-tech start-ups with radical innovations with no existing markets may need to spend a considerable amount of time convincing the potential customers of the credibility of their product: some disruptive solutions even need to be tried out by customers before they believe it is possible.

According to Maisala, doing market research is not so much guided by whether the innovation is disruptive or not, but has more to do with the team's understanding of the market: "Market research is usually used to try to compliment [the team's] lacking understanding of the market". Maisala sees that the need for market research is not tied to the level of innovativeness of the product or service, but to the skills of the team and to the market that they are targeting. He states that when dealing with existing markets, there are usually figures and estimations available, whereas with radical innovations the market research is more qualitative, such as visiting industry experts and trying to validate whether the solution is possible and whether there would be markets for it. However, he says that when a start-up does market research in a field that already has some existing solutions available, it is more similar to market research conducted by existing businesses.

What comes to the tolerance of uncertainty and failure, Maisala feels that he is not the optimal person to answer the question and thinks that it would be a better question posed for an entrepreneur. However, his perception is that some entrepreneurs are so in love with their own idea and want to take it further without thinking about the huge obstacles they may have ahead.

When talking about creativeness and flexibility, Maisala states that he does not have experience in working in a big corporation and therefore it is not possible for him to compare the utilization of creativeness and flexibility in a start-up versus in a large corporation. However, he says that in start-ups "creativeness is not limited by whether one gets the management excited", which on one hand may be the case in large corporations, where management have their eyes set on the next quarter's results and may find it hard to allocate money for a radical innovation which typically brings results on a ten-year timescale. On the other hand, he sees that in big corporations if one has the management's support and resources, there may not be as much industrial pressure as in start-ups that are always lacking money and investors expect to get further: there is only one line of business and results are expected to take place fast. According to Maisala, in radical innovations creativeness

is needed to figure out how the innovation can be applied, which may be easier in a start-up than in a large corporation that already has well-established clientele and they tend to think of something new to deliver for that specific clientele.

According to Maisala, the biggest challenges faced by Finnish high-tech start-ups in pursuing disruptive innovations and how to tackle them are, first of all, the fact that “disruptive innovations are not born easily”. He sees this perhaps more as an economical issue in Finland that it has not been established how the rather large amounts of money allocated towards basic research could be turned into commercialized innovations; from the point of view of effectiveness, Finland is not number one. However, some disruptive start-ups are born. According to him, some of them – if looking from the area of basic research – have the challenge of funding: considerable amounts of funding would be needed to research whether the innovation is possible.

Maisala states that if a radical innovation has been invented, funding can usually be found. However, he sees that more public money that is allocated to new businesses should be directed towards disruptive innovations. He states that disruptive innovations are the ones that face the most challenges in the beginning; they are more prone to fail and entail higher technological risk and more market risk compared to sustaining innovations. Furthermore, he says that the funding sources are very small in the beginning compared to the large potential that disruptive innovations can entail, and more money should be spent towards the innovation in the early stage to see whether it takes off. According to Maisala, start-ups pursuing disruptive innovations usually find funding when they have tackled the first steps, such as had something patented: when the technology is patented and there is a vision of where to apply it, funding is usually available. However, he says that at the initial stage where one only has an idea of whether something could be done, subsidies are very small. According to Maisala, that is the point where the public funding is perhaps not directed in the most optimal way.

According to Maisala, with disruptive innovations mistakes are perhaps made in estimating the market, as it cannot usually be solved by buying external market research but by having understanding of the market where one is aiming at and its possibilities. Maisala states that “radical innovations do not follow a linear path”: it is not possible to directly see whether one is going to be a success or not. He says that there are surprises and after several failures something can finally break through. However, during his twelve-year career in working with start-up teams Maisala does not recall seeing any disruptive high-tech start-up that has come through their development programs and reached a turnover of 100 million or even 50 million. In general, concerning tackling the challenges, Maisala sees that “it takes more faith [from the disruptive start-up entrepreneur] to believe that the obstacles can be won”.

The discussion with Maisala was extremely insightful. With gratitude to his solid experience and expertise in the topic field, the discussion offered an irreplaceable opportunity to gain deeper understanding of the challenges faced by Finnish high-tech start-ups pursuing disruptive innovations and how to overcome the challenges. It provided an excellent starting point for the case study.

4.2 Results of the Case Study

As mentioned in the methodology chapter of this thesis, it was the request of the interviewed member of the management of the case company to take part into this research anonymously. Therefore, neither his name nor the name of the company will be published in this research. The case company – in the context of this thesis referred to as ‘Company X’ – engages in high-tech directed to industry. The industrial sector is an old, traditional industry, which new technology is being created for. To reserve the anonymity of the company, detailed information such as milestone years or any financial figures cannot be published in this context. However, it can be stated that the company was established during the last decade. Regarding the size of the company, it fits into the classification of small and medium sized enterprises (see Statistics Finland n.d.). The growth of the business has been impressive, and the

company can be described as born global, which is a concept originally introduced by Welch and Luostarinen (see Welch and Luostarinen 1988). There are several definitions for the concept, but certain criteria are common to the definitions: born global is a business that operates in at least one foreign country, sells at least one product or service, and has started exporting shortly after its inception ('Defining the Born Global Firm': A Review of the Literature 2009, 2).

4.2.1 Results of the Documentary Analysis

The documentary analysis of Company X included studying the company website and other publicly available internet sources such as videos, interviews, articles and news. It provided a comprehensive picture of the company's journey from a start-up into a successful, well-established growth business.

To reserve the anonymity of the company, detailed narrative of the success story cannot be included into this publication. Therefore, any industry specific references or themes must be omitted from this writing. However, the important and worth-mentioning issues in this context are subject matters that do apply to most high-tech start-ups in general, and therefore they are the areas of interest of this thesis.

The documentary analysis clarifies that Company X got started from the initiative of people who worked in that specific industry, and from their realization that there was something that had not been yet invented but that could be developed and commercialized to greatly benefit the industry. Their product developed was an answer to the changing times and filled a gap that had existed – perhaps a gap that had not been acknowledged, as the industry was rigidly set in its stabilized ways and functioning models.

With a very limited budget and by putting countless of hours of work in, the start-up managed to obtain some financing and thus develop the product further. The documentary analysis reveals that the company has received funding from actors in the Finnish innovation system. With persistent attitude, hard work and a solid faith in

the product, they gradually managed to build foothold among customers and also investors, through which the company was able to bring the business into a new level - to hire a professional CEO and to further internationalize. Becoming international was a conscious objective that the establishing members of the company had set very early on in the business. These days, the company is renowned for its high growth and intelligent, advanced solutions for business to business customers.

The documentary analysis sheds light on the reasons behind the success of the company. The product was commercialized in an optimal time and it provided a solution to a problem that was faced in the industry, delivering noteworthy benefits to the users. Moreover, in addition to the other benefits obtained by the customers, it also provided savings to the users, therefore offering a grounded incentive for customers to engage in employing it – regardless of the disruptive nature of the innovation.

Furthermore, the documentary analysis suggests that the product entails green values, thus offering customers yet another incentive to employ it. As it is a business to business product, engaging in green values – in addition to other benefits gained from using the product – can work as a positive public relations tool for the customer.

4.2.2 Results of the Interview

The person interviewed from the case company, Company X, was a member of its founding team, hereinafter referred to as 'Manager X'. He still holds a managerial position in the same company.

The interview questions can be found in the appendices. However, as the pre-planned interview questions included questions from which the company could be recognized from, some of the questions are therefore partially omitted from publishing. Furthermore, as explained, the interview was semi-structured and the list

of questions was not rigidly followed. Moreover, the original questions were in Finnish, as the interview was held in Finnish. Therefore, the list of questions was translated into English.

According to Manager X, the background of the establishing members played a considerable role in the creation of the start-up. They had a clear vision of what the industry was lacking and how efficiency could be improved. All the establishing members had solid skills in their own areas of expertise: knowledge of the industry, business and technology. Responsibility was clearly divided from the very beginning. The establishing members were not friends in the beginning and still are not – instead, Manager X emphasizes that they work together, keeping business and private lives separate.

Describing the start-up's financial situation in the beginning, Manager X recalls that they started off with a minimum budget from their own pockets and concentrated on working long and hard hours. One of the establishing members with a business background was extremely skillful at planning their budget, making it possible for them to rely on self-finance for the first six months. After that they received few thousand euro support from a business incubator, which enabled them to hire their first consultant to chew on the business idea. They got their first small office room, which, however, was mainly used as a postal address. These developments led them to obtain some more funding, which, however, was never utilized. However, it was an important milestone that the technology they had so intensively developed for almost a year finally brought them street credibility in a sense that they were a company worth funding. Further on, they were able to obtain a larger capital loan from a public sector actor in the Finnish innovation system, which enabled them to move forward and to hire their first employee. According to Manager X, a capital loan is an excellent instrument for young companies as it does not affect the balance but is treated as a loan, which means that there are no taxation problems and it instantly has a positive effect on the value of the company. This enabled them to start negotiating their first proper investment with another actor in the Finnish innovation system. As before, a funding consultant was strongly utilized to support

the negotiation stage. Manager X states that one of the secrets of the company is that they have never tried to do something they cannot do: they have always utilized professionals where needed.

When further discussing funding and the availability of it, Manager X says that obtaining funding is never easy. According to him “dream cases are extremely rare, they do not tend to exist in real world”. However, he points out that they have been a dream case for investors: the investors have made a profit of several hundreds of percent with the money they have invested in them. However, according to him, even though headlines sometimes make it look easy, in reality it is nothing but hard work. He says that investors are naturally greedy, but they cannot be blamed for that: “they of course want as much as possible and want to pay as little as possible for it”.

Manager X sees that the reasons behind Company X obtaining funding were hard work, using an external funding consultant and searching for funding from the correct sector. According to him, if establishing a company, it is crucial to have a clear vision of the business idea from the start. In their case, they work in their own industry and they are familiar with it. According to him, the problem is that “people do not think of their business idea outside their own box” and do not consider how many others are already in the business. He stresses the importance of being unique and standing out from the crowd. Figure 10 illustrates the underlying factors that positively affected Company X’s success in obtaining financing.

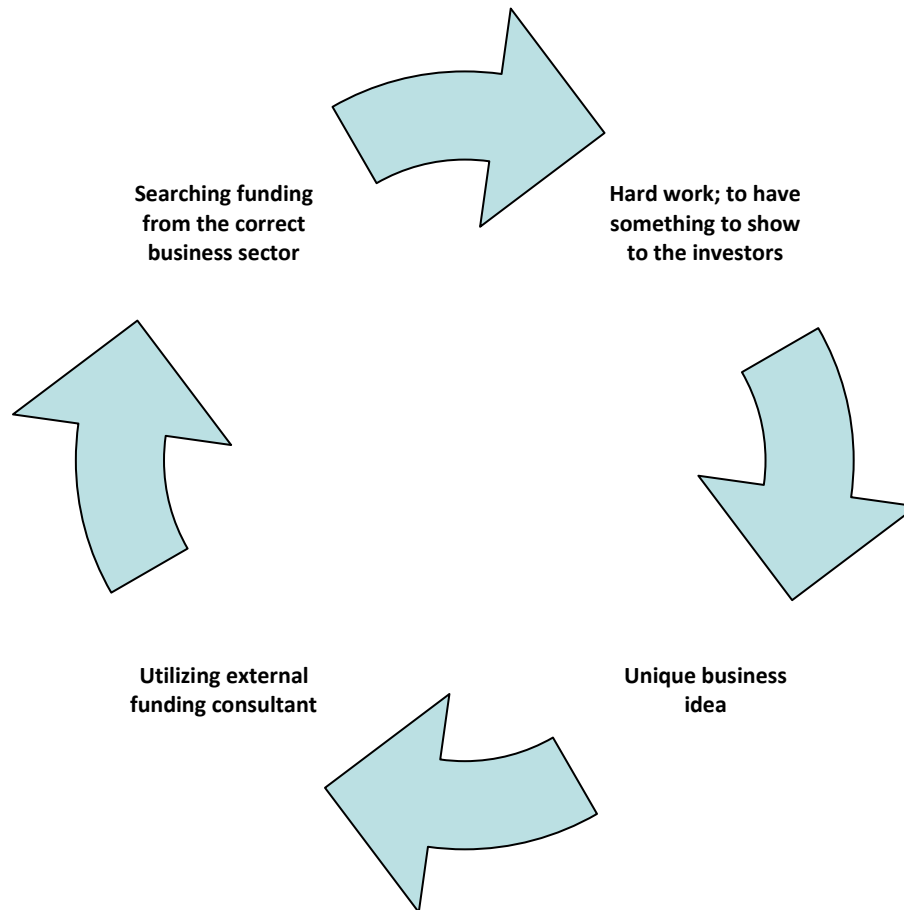


FIGURE 10. The reasons behind Company X's success in obtaining financing (according to Manager X).

According to Manager X, their product itself was not that complicated, but the challenges came from marketing and launching the new product into the industry. He recalls a funny part in their success story: the technology that they developed almost for the first year was only to have something to show the investors, and any technology from those days did not actually end up being utilized in their final products. They decided to bury their original product idea because they were not able to seamlessly answer in one sentence why anyone should buy their product. The current product idea came along, in truth, as a side project. Therefore, also chance plays a role in their success story.

However, Manager X emphasizes that the basic business idea for the company was very clear. Nonetheless, he stresses the importance of a young, developing company to accept that the first product may not be the big hit and that the success product can be found on the side by accident. According to him, it is crucial to stay focused,

but not to blindly go for the one and only goal in the first years, as that can lead to missing golden opportunities.

Company X had a goal from the very beginning to become a large, international business. They have entertained a strategy of strong growth and therefore have welcomed considerable outside investment, which has in turn affected the establishers' own ownership rates in the company. However, Manager X does not regret having a relatively small ownership percentage: "-- probably I would be more wealthy had we chosen a strategy of slow growth that we would have taken less money in, done less research and development and exchanged less -- but on the other hand, this would not have been equally fun, as we have gone high and fast --". Nowadays, their product is starting to be the de facto standard in the industry: almost every player in the industry has their product. Furthermore, the customers even tend to allocate yearly budgeted money towards buying their products, excited to see what new they have to offer every year. Again, Manager X reminds that this would not be possible had each of the establishing members not been so clearly in their own industry.

Manager X notes that the outside investment and the growth expectations placed by the investors have had an impact on the aggressive growth strategy that the company has employed. However, due to the special nature of the industry, the investors have been flexible when necessary. Occasionally, there have been complaints from the investors' side of the growth not being fast enough, but the reasons have been beyond the company's control, such as the fluctuations of the world economy. Manager X is pleased to tell that nowadays they have finally started to have a mutual understanding with the investors and investors accept the long-term nature of their investment, which makes it safe for the company.

When discussing market research, Manager X says that they knew the market situation, but had to have market research done in order to convince the financiers and other related parties. To do that, they utilized a pricey, well-respected market research consultant. However, in their case, the market research had merely nominal

value: he saw the market research only as a way to convince financiers, as they themselves had a strong understanding of the industry, due to the small size of the industry and their personal background in it.

According to Manager X, to be the first one to offer a new product to the world has its benefits but also downsides. On the positive side, the lack of competition means that there are no tender bids. However, selling something is always easier if there are others to promote the sales. He says that “no matter how good a product is, if no one else is using it there is always a doubt that why on earth should it be used, even if it looked good on the paper”. This makes the first sales very difficult. However, according to him “sales is a power sport, it is nothing but a power sport at the end of the day”. This statement, again, emphasizes the importance of hard work.

When discussing the timing of the launch of the disruptive innovation, Manager X states that the product has to fit into the current trends of the industry. For example, their product would not have made sense or been otherwise possible twenty years ago, but is nowadays something that every considerable player in the industry must have.

Even though Manager X and his company do appreciate green values, he sees that they are not yet something that a customer company would base their buying decisions on. Even though he sees green values as a possible sales argument where applicable, companies do not commonly base their buying decisions on them, yet though green values are something that can be cleverly utilized on the public relations level.

When their solution was first introduced to markets, there were no direct competitors. However, what were considered as competitors were companies that aimed to solve the same problem with a different solution. These companies were competing from the same budget monies allocated by the customer companies to solve the particular problem. Nowadays, there are competitors with more similar solutions available, but not anything that quite matches up with Company X's

offering. According to Manager X, they have differentiated themselves from competitors first of all by doing sales more close to the customer: “-- we have tried to go as deep as possible into the customer organization, in a way that would allow us to build our solution into the customer organization so that it is not actually our product but part of the functioning model of the customer organization”. Secondly, according to him, they have tried to make their technical solutions as easy as possible to the customer organization, ensuring that there would be as few as possible requirements concerning what the customer has to provide and what they have to know and have skills for. According to Manager X, they have always tried to break all functioning models and role models of the industry, and aimed at introducing new ways of thinking how everything should be done, who is responsible of what and why. According to him, this approach has brought them a lot of positive feedback.

In a strategic time, Company X hired a professional CEO to take over the management of the company. This enabled the company to move from a start-up into a growth business. Hiring a professional CEO is a move that he recommends for start-ups at a certain stage. According to Manager X, for a professional manager to take over a start-up is no enviable position, especially if the establishing members still stay on; there is competition which is reflected as different forms of disorder. On the other hand, he sees that establishing members rarely possess enough experience and vision of large business operations that they would be able to take the company as far as a professional CEO can, which makes it inevitable at some point to hire a professional CEO. According to Manager X, it takes quite a long time to teach the new CEO all the functioning models and values of the company. Furthermore, the new CEO tends to also bring on his own people and there are clashes of values and functioning models, as well as the demanding task of training the new management in. According to him, the establishing members are at that point left with a role of police, trying to guide the new management into right direction and to avoid them from making big mistakes, as the new management on the other hand usually has a strong need to show that they have everything under control. Manager X sees this as a very difficult but a necessary stage; after that the development of the company

becomes steadier, even though there will always be some stages of growing pains. According to Manager X “bringing a professional CEO in lifts the company one step upwards -- it functions more strongly and then [the CEO] becomes a person to lean on when you are losing faith -- that person has probably experienced this before”.

Even though Manager X recommends that start-ups hire a professional CEO at a certain stage, he stresses the importance of selecting the right person. According to him, the request for a professional CEO usually comes from the investors, but start-ups must be careful as investors tend to recommend certain people who may not always be a good choice. Therefore, he stresses the importance of being aware of the trickiness of this stage.

When discussing creativeness and the opportunities to utilize it, Manager X sees that it is completely dependent on how the management supports creativeness and new ideas; “At ours it has always been on the table and it has been acceptable to question all functioning models--”. According to him, when there are more resources and when a company grows, there is more room for creativeness. He views that a larger company is not more rigid than a smaller one, with the exception of truly large conglomerates. However, he sees the whole discussion of creativeness and its importance in a growth business as a cliché, as without creativeness there would be no new ideas. What he considers meaningful is that the development of the company should be on-going.

When summing up the biggest challenges in Company X’s journey from a start-up into a growth business, Manager X states that “it all circles around money at the end”: if the business idea is good and there are right people involved, which should be the basic prerequisites, the biggest challenge is to have the patience to focus on following and maintaining the funding and the cash flow. According to him, cash flow is everything to small start-ups, and it should be carefully looked after. Furthermore, he states that to secure funding, countless of hours of work must be done – even if it at times would seem meaningless to spend weeks or months clarifying the theoretical growth expectations to a financier.

When asked about the secret of Company X's success, Manager X says that "there is no secret, it is just work". He sees that if one has a good business idea, he should talk about it as much as possible with other people in the industry, forgetting the rigid ones that are set in their ways. Furthermore, he states that selecting the establishing members is the most important choice: one should not start a business with a friend, but with people who know what they are doing. Moreover, he stresses the priority of dividing the responsibilities from the very beginning in order to secure that everyone knows their own fields. Manager X also acknowledges the importance of deciding the ownership proportions: even though one gets richer by owning most of the stock himself, if one aims to do something revolutionary, the ownership should be rather equally divided.

Manager X sees that Finland is lacking of entrepreneurial culture: people are not encouraged to do anything big. He says that "in Finland one cannot get rich, it is wrong". In his opinion, even though Finland is a good country to live, the power that envy has in Finland is extremely strong, and it is something that one cannot be proud of. In fact, Manager X sees the prevailing attitude as one of the reasons explaining the lack of success stories in Finland: "If one aims to do something big from the very beginning, he is branded a megalomaniac or an opportunist". According to him, in Finnish language 'an opportunist' is a negative word, even though in his opinion an opportunist is a smart person if he notices a good opportunity and embarks on seeking success through that.

The discussion with Manager X was deep and utterly significant in establishing the picture of the main challenges faced by disruptive Finnish high-tech start-ups. Furthermore, it provided crucial information on how to successfully navigate the start-up towards growth and success. Manager X's extensive expertise and practical experience as a start-up establisher provided an opportunity to gain a far-reaching understanding of the subject matter.

5 DISCUSSION

Taking into account the findings derived from the expert interview and the case study – including the documentary analysis and the interview with the start-up establisher – it is possible to draw the conclusions of this study and to discuss the significance and the use of the information obtained.

As already discussed in greater detail in the methodology chapter where reliability and validity of this research were evaluated, it must be stressed that the findings derived from this study are not highly generalizable, as, in addition to the expert interview, there was only one case company involved. However, the significance of the findings is considerable because there is not much existing research available concerning this specific topic. There is research done concerning disruptive innovations, high-tech companies or start-ups or innovations in Finland, but to combine these nominators into a united context is something that has not been widely researched earlier.

The findings of this research are of interest to entrepreneurs and managers of disruptive start-up companies, or to anyone aspiring to become one. The findings will help start-up entrepreneurs and managers to better understand the main challenges faced by disruptive high-tech start-ups, and will, therefore, aid them in their strategic decision-making and navigating the start-up to the most optimal direction towards growth. For start-ups other than disruptive, the findings will apply partially, and the results from the expert interview and case study offer several valuable lessons that can be further generalized also for their purposes. Furthermore, the findings will offer food for thought for also other managers, financiers, venture capitalists, policy makers and any other possible players in the innovation system.

5.1 Comparing the Results of the Empirical Research to the Literature Review Conducted

As the empirical part of the study confirms, disruptive high-tech innovations – and disruptive innovations in general – are rare in Finland. This finding is in line with the information already obtained through the literature review. However, again supported by the literature, disruptive innovations – although highly risky – have a large potential to turn a start-up into a considerable success story, if a breakthrough is achieved.

Moreover, the empirical research suggests that the problem lies on identifying the market potential: it is challenging to come up with disruptive ideas that are also *marketable*. Particularly, applying the idea to business and getting customers are phases that pose challenges: the importance of product/market fit is perhaps not so well understood or considered when a start-up entrepreneur launches a disruptive innovation. The empirical research suggests that investors do not base their decisions so much on the fact whether the idea is disruptive or not: what matters is that there is business potential. However, the challenge with disruptive innovations is that the potential is not so easily estimated, as the markets do not exist. This finding is in line with Christensen's (2000) five principles of disruptive technology.

Furthermore, the empirical research carried out shows that the timing of the launch of any disruptive innovation is crucial: it is of great significance whether the product fits into the trends and functions of the time – whether the market is ready for it. As the empirical research suggests, some disruptive innovations would not have been successful had they been introduced earlier, as they are strongly related to the current time and current needs of the customers. Also this finding is in line with the literature review conducted, stressing the importance of introducing solutions that are, on one hand, not too similar to current ones, but on the other hand, not too advanced or far ahead in time, either. The line that determines the optimal time for launching any disruptive innovation is very fine and obscure: it is something that can

be best understood by having extensive knowledge and expertise of the specific industry in question.

Moreover, also the timeline of successful commercialization of a disruptive innovation differs from the one of a sustaining innovation: as the empirical research suggests, turning the disruptive innovation profitable is usually a long road, especially if compared to sustaining innovations. This finding is in line with the previous literature published, showing that disruptive innovations are more long-term projects than sustaining ones, and the initial growth of disruptive innovations is slower than what the entrepreneurs have originally expected.

The empirical study confirms that there is funding available for high-tech start-ups with disruptive innovations. In fact, the study suggests that high growth potential make disruptive innovations perhaps even more attractive investment objects than sustaining innovations. Furthermore, the study also shows that the risky nature of disruptive innovations is rather well understood by the investors, and investors generally accept the long-term nature of their investment in disruptive innovations, which is a finding that is not completely in line with previous viewpoints presented in literature. However, the explanation may be that – as also stated in the literature review – the investments have only recently started to be more strongly and purposefully directed towards disruptive innovations, making this a new development.

However, the empirical research also sheds light on the problem that at the initial stages of the business – when there is hardly more than a disruptive idea and nothing is yet patented – finding funding is difficult, and the amounts possibly obtained are very small. The study shows that obtaining funding gets easier when the start-up has got something patented and has managed to gain some foothold among certain actors in the innovation system: when credibility is established and the company has some realistic plans and growth projections to show. However, many disruptive start-ups do not ever make it that far: as the empirical study shows, disruptive start-ups face the most and the hardest obstacles in the very beginning of

their story, making it a crucial time that can either make or break them. This problem – specifically related to the early-stage funding of disruptive high-tech start-ups – is something that did not become clearly visible through the literature review conducted, therefore making this a significant finding obtained through the empirical part of the study.

The empirical research suggests that market research does not play a considerable role in disruptive innovations. This finding is in line with Christensen's (2000) five principles of disruptive technology – pointing out that unknown markets cannot be analyzed – and also with other pieces of literature reviewed. The challenge is to have a comprehensive understanding of the product's suitability to the current market situation, and if it suits to the trends and the preferences of the customers. This understanding is something that cannot be easily bought by hiring a market research consultant, but can only be obtained through comprehensively and thoroughly knowing the industry. As for a disruptive solution, being a first mover has both its advantages and disadvantages: there may be no competition, but there are no mutually reinforcing co-solutions, either. Furthermore, a radically new solution is prone to attract plenty of doubts.

Marketing of disruptive high-tech innovations – how to positively foster the adaptability of customers to embrace the new solution – is yet another challenge faced by Finnish high-tech start-ups pursuing disruptive innovations. The empirical research suggests that the disruptive solution must be more strongly communicated and explained to the customers than a sustaining one. Furthermore, an issue established, which also became prominent in the literature review conducted, is that there is learning required of the customer: sometimes even concrete testing is required before it is believed to be possible. To overcome these challenges, it is important that using the new disruptive product is as easy as possible to the customer and there are as few demands as possible regarding other possible equipment or skills needed to use the product.

The empirical research suggests that a considerable factor in achieving success with disruptive innovations in any industry is to have comprehensive knowledge of the industry. This implies that it is desirable to have a background in that specific industry. However, even though solid experience and strong expertise regarding the core competences of the business are desirable, the findings of the empirical research also suggest that one should not try to do everything alone: employing professionals such as financial consultants can help a start-up in its way to success. It is important not to try to administer areas that one is not familiar with, but to let professionals carry out the duties that the start-up team does not have competences for. Furthermore, the empirical research suggests that employing a professional CEO can bring the start-up to a new level: a skillful, experienced management team brings prestige and credibility, not to mention valuable insights and competences into the business.

The empirical research suggests that successfully pursuing a disruptive innovation requires the start-up entrepreneur to have a solid faith in the product or service: one must have a clear, strong vision of the future of the business and to firmly believe that the obstacles encountered can be won. Start-ups pursuing disruptive innovations tend to face more obstacles than start-ups pursuing sustaining ones. However – as recognized also in the literature review conducted – if a disruptive innovation is successful, higher risks turn into higher rewards.

5.2 Answering the Research Questions

The research questions defined in the beginning and set to be answered were:

1. What are the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations?
2. How do these companies successfully overcome the challenges?

The results chapter and the previous subchapter – comparing the results of the empirical research to the literature review conducted – already shed some light on answering these questions. However, the purpose of this subchapter is to concisely state the main challenges and how to overcome them, and to ensure that the answers to the research questions become clearly and precisely communicated.

5.2.1 The Main Challenges Faced by Finnish High-Tech Start-Ups Pursuing Disruptive Innovations

The research suggests that the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations are as follows:

- Identifying disruptive innovations that have market potential
- The length and riskiness of the process
- Obtaining adequate funding at initial stages of the business
- Marketing of the disruptive innovation

Even though innovations that can be described as truly disruptive are quite rarely invented in Finland, it is even rarer to come up with disruptive innovations that also have market potential. It is not enough to have an excellent product or service, but the crucial point is that there must be customers for it: the solution must be marketable. This can be identified as one of the main challenges of Finnish high-tech start-ups pursuing disruptive innovations.

Secondly, the length and riskiness of the process of pursuing disruptive innovation and successfully commercializing it is another challenge commonly faced by Finnish high-tech start-ups. The long-term nature of the commercialization process of disruptive innovations comes as a surprise to start-up entrepreneurs, and the slow growth in the beginning of the process is something that the entrepreneurs are often not prepared for. However, with disruptive innovations it is usually not possible to reap returns as early on as with sustaining ones: disruptive innovations entail higher risks, but if successful, also higher rewards.

Yet another significant challenge for Finnish high-tech start-ups pursuing disruptive innovations is obtaining adequate funding at initial stages of the business. In general, funding is available for disruptive innovations: many investors favor them due to the high return on investment potential they entail. However, the availability of funding is not equally divided along the time scale of the process: in the beginning of the business story funding is difficult to find. This means that the disruptive start-up is not able to bring the business into the next level, which would be a necessary step to take in order to achieve growth. This leads many start-ups to have to drop out.

Moreover, marketing of disruptive innovations is an obstacle generally encountered by Finnish high-tech start-ups. Marketing of disruptive innovations cannot be approached in a similar manner as marketing of sustaining ones: in the case of disruptive innovations, there are more doubts faced by the customers. The customers must be convinced that the product or service is, in fact, possible. There is considerably more reassurance, explaining and communicating needed in order to overcome these barriers.

5.2.2 Successfully Overcoming the Challenges of Pursuing Disruptive Innovations

To overcome the challenge of identifying disruptive innovations that have market potential, the start-up establishers must have a comprehensive understanding of the specific industry in which they operate in. In fact, the establishers should have first-hand practical knowledge of the industry, such as a background of work history in the industry. Furthermore, they must be able to see beyond their own preferences and attachment to the innovation and to critically question whether there are customers for the product or service.

To survive the length and riskiness of the process, the start-up establishers must have a solid faith in the product or service, but also realistic expectations and understanding of the incalculable process of dealing with disruptive innovations.

Even though it is healthy and recommendable to have clear vision and goals, rewards cannot be expected too early on. Furthermore, tolerance of risk, uncertainty and pressure is necessary.

Obtaining adequate funding at initial stages of the business is yet another difficult challenge for the start-up establishers to overcome. As the research suggests, the funding – both public and private – is not equally divided throughout the process: obtaining funding gets easier when the start-up has managed to gain some foothold and credibility. However, to reach that point, funding is necessary. As derived from the research, the start-up establishers should not try to do everything alone: even though money is scarce in the beginning, it may be smart to invest it into a financial consultant to help the start-up in negotiating financing, or to administer any other crucial areas of importance in which the establishing members lack skills for but which are fundamental in order to obtain financing. In addition, it is recommendable to carefully plan the budget for the first few months: when there is not much money to spend, it is crucial to keep the expenses at minimum and compensate the lack of money with harder-than-ever work. Furthermore, to obtain financing there must be clear and reliable calculations and growth predictions to present to possible financiers and investors. Obtaining financing takes a lot of effort and work – and again, faith.

To overcome the challenges related to marketing of disruptive innovations, it is of utmost importance to place emphasis on the way that the innovation is communicated to the customers: there is more reassurance and more specific explanations needed. Depending on the nature of the innovation, sometimes even an opportunity to personally test out the product or service is needed to convince the potential customer. As disruptive innovations usually require some readjustments or adaptation of the customers' side, it is important to make using the new disruptive product or service as easy as possible to the customer and place as few as possible demands regarding other possible equipment or skills needed to use the product or service.

Figure 11 summarizes the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations. Furthermore, it also presents solutions for overcoming the challenges successfully.

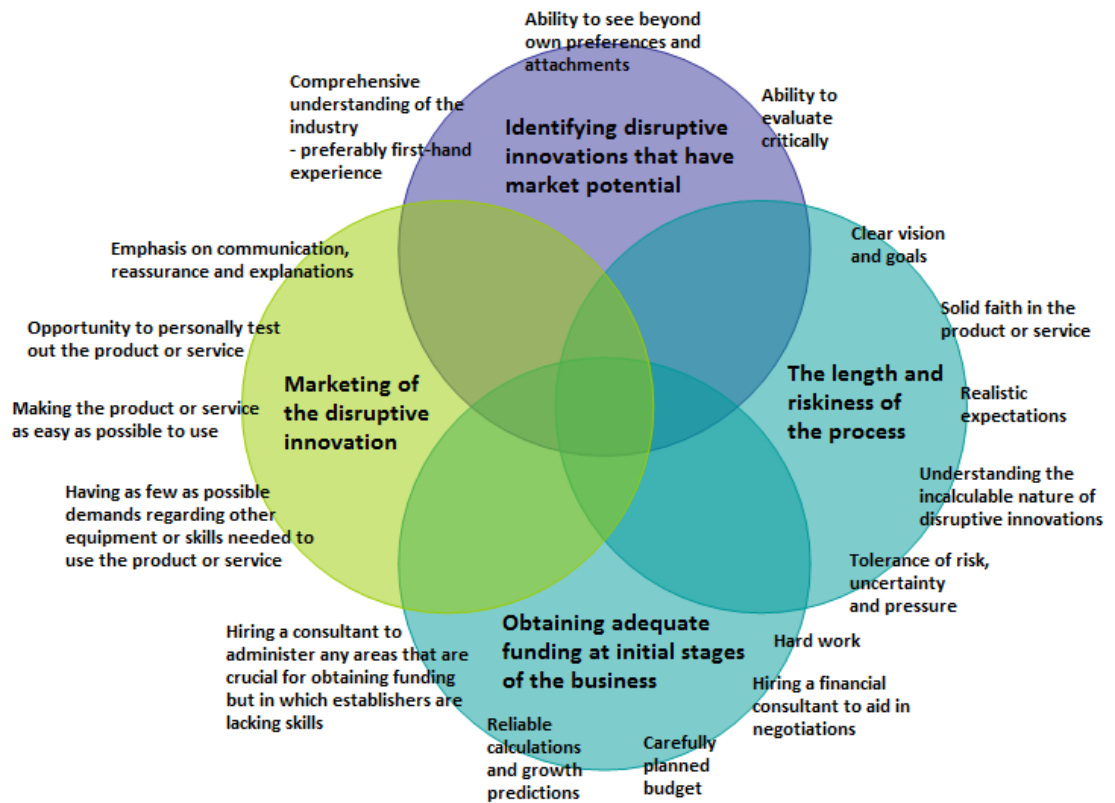


FIGURE 11. The main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations and how to overcome them successfully.

Figure 11 is an illustrated answer to the research questions. The main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations are presented in the circles. Furthermore, the solutions for overcoming the challenges successfully are presented around the respective circles.

5.3 Limitations to the Research and Suggestions for Improvement

A major limitation to the research is that not more than one case company to study was able to be found. However, it was known from the very start of the process that there are not many disruptive companies in Finland, and the selection is even narrower when investigating high-tech companies who have commenced as start-

ups and have successfully commercialized a disruptive innovation. However, it was still surprising that it was not possible to find at least two disruptive high-tech companies willing to take part in this study. However, that further increases the author's gratitude for the manager who was willing to be interviewed.

One could now question that why was such a narrow and focused theme chosen to be studied: one could argue that it was not the easiest or smartest choice if there were difficulties with obtaining case material. However, the topic of this thesis work is extremely relevant: in addition to the trend of choosing disruptive solutions as investment targets, high-tech start-ups are a very momentous topic in Finland, as Finland is renowned as a high-tech country. Furthermore, the increasing investment in disruptive innovations is likely to further increase the attempts of high-tech start-ups to excel in disruptive innovation, thus making the topic even more up-to-date. Therefore, it was chosen to focus this study towards this narrow selection in order to produce new information: to research something that has relevance in the current business context but that is not widely studied yet. That increases the significance of this study.

Whether the optimal depth was reached in this research is a question better judged by the readers, as it is not ever an easy task to evaluate one's own work objectively. However, it is likely that the research could have probably gone deeper had more case companies been involved: that would have perhaps enabled the establishment of more avenues to investigate. However, it can be confidently stated that the main challenges and how to tackle them were discovered, and as that was the objective of the research, the goal has been reached. After all, the purpose of the research process is to be able to answer the pre-determined research questions and that is something that was achieved. However, having more material – case companies – to work with would have been beneficial in order to improve the generalizability of the findings.

The approach selected – utilizing both an expert's opinions and also conducting a case study – offered an opportunity to gain a broad and multifaceted picture of the

subject matter. Inspecting the issue from different angles and through the glasses of different parties made the research more comprehensive and offered perspectives that could have been left unnoticed had only one of the angles been employed. Afterwards thinking, it would have perhaps been beneficial to include yet another angle into the study: to interview an investor. That could have provided deeper insights into the problems related to the early-stage funding of disruptive start-ups.

Christensen's (2000) five principles of disruptive technology were used as the main theoretical framework for this thesis. The presupposition of the author was that there could be lack of acknowledgement of these principles among Finnish start-ups, which may cause challenges. The purpose was to look for new viewpoints and insights into the topic: to dig as deep as possible into the query and look for reasons and explanations beyond the generally known challenges, such as risk-averseness, the complexity of the Finnish innovation system, lack of incentives for growth entrepreneurship and the fact that creativeness is often left unutilized. Therefore, Christensen's (2000) five principles of disruptive technology were strongly utilized in formulating interview questions that aimed to gauge the existence of challenges related to the principles and its repercussions. However, the empirical research conducted does not suggest there to be lack of acknowledgement of these principles. This does not effectively mean that the framework chosen was not appropriate, as utilizing this framework did enable the inspection of reasons behind the expected ones. In fact, the empirical research suggests that the main challenges for Finnish high-tech start-ups pursuing disruptive innovations are not necessarily the ones that have been generally presented in literature regarding innovations.

However, to further consider the question of whether the selected theoretical framework utilized was the most optimal choice for this research project is something that cannot be exhaustively answered to. Perhaps there could have been also other viewpoints to approach this topic. Furthermore, it is possible that when strongly focusing on finding new reasons and explanations, the importance of the already known challenges presented in previous literature could have been neglected. However, the fact that the interviewees were let freely state the main

challenges in their opinion – and that their opinions are mutually reinforcing – gives confidence that the matters uncovered are valid.

5.4 Recommendations from the Research

The answer to the second research question – how Finnish high-tech start-ups successfully overcome the challenges they face in pursuing disruptive innovations – informs start-up entrepreneurs of how to successfully tackle the major challenges typically encountered. The main implication or recommendation derived from the findings of the study is that start-up entrepreneurs pursuing disruptive high-tech innovations must be aware of the difficulties of the process and acknowledge the unique nature of disruptive innovations: one should be ambitious but realistic. Disruptive innovations cannot be treated or approached in a similar manner as sustaining ones, as there are several matters that significantly differ from dealing with sustaining innovations: evaluating market potential, the length and riskiness of the process, and the problems related to funding and marketing. Therefore, it is crucial that – in addition to any general matters needed to be taken into account when starting a business – start-up entrepreneurs pursuing disruptive high-tech innovations place an emphasis on focusing on the challenges caused by the disruptive nature of the innovation. Only then can the challenges be successfully overcome.

In addition to the recommendations for Finnish start-up entrepreneurs pursuing disruptive high-tech innovations, it is relevant to provide recommendations for actors in the Finnish innovation system, such as financiers and educational institutes. It is clear that the innovation system of a country plays a focal role – both directly and indirectly – in that it determines the prospects for start-up entrepreneurs to pursue disruptive high-tech innovations.

As one of the major problems for Finnish high-tech start-ups pursuing disruptive innovations is identifying the market potential of the innovation, it raises a question of how to avoid mistakes when estimating the potential. In fact, this is a problem

that can never be fully eliminated, as markets for disruptive products and services tend to be unknown and immeasurable in traditional ways. However, as the research suggests, in order to evaluate market potential, one must know the industry thoroughly. As Finland is renowned for its high-tech knowledge, perhaps one of the underlying issues could be that the country is rather heavily centered towards research and development and education – which is top-class – but does not truly evaluate the tools it gives for pursuing disruptive innovations. For example, for engineers, evaluating the market potential of their high-tech innovation may be difficult, as they are used to inspecting the product from the perspective of engineering. A business student, on the other hand, may have – at least in theory – a better starting point for understanding market potential, but falls short in understanding complicated high-tech solutions, and therefore is unlikely to come up with a disruptive high-tech innovation. Consequently, it might be beneficial to improve opportunities for students to cross-study the disciplines and to offer them more opportunities to gain broader know-how also from outside their main field of study – such as being commonly able to simultaneously study high-tech and business. This could be a fruitful approach in creating new disruptive start-up teams and success stories that would also positively affect the economy of the country. Furthermore, this approach could aid in reaping returns on the considerable amounts of money – even when reflected on international standards – that Finland invests in research and development.

Furthermore, there is a significant problem related to financing disruptive innovations. Even though financing is starting to be more focused towards disruptive innovations, there is a considerable gap that is visible at the early stages of the business: when there is merely an idea and nothing is patented, it is very difficult for a start-up to obtain funding, or if obtained, the amounts are notably small. This is a problem that prevents many disruptive high-tech start-ups from ever seeing daylight. Therefore, the recommendation for actors of the Finnish innovation system is to direct financing towards the early stages of a start-up's life cycle. It is also necessary to improve the identification of disruptive innovations and their market potential: to recognize promising innovations early enough and to provide proper financial

support in the early stages of the business to enable the start-up to promote the business. The risks entailed are higher, but if the innovation becomes successful, the rewards reaped will famously pay off the entailed risks in the long term. Therefore, when considering the situation of a serial financier – such as a public actor in the innovation system – the increased amounts invested would improve the prospects of success for the disruptive start-ups, and in cases where success would not follow, the losses of the investor could be compensated by the returns of investment gained from the successful cases. When compared to investing into sustaining innovations, there may be less risk related to sustaining innovations, but on the other hand, the rewards expected to be reaped from sustaining innovations are also generally smaller.

Moreover, as the research suggests that utilizing consultancy services in areas where the start-up establishers are lacking skills can have a positive effect on the business, it is, therefore, necessary to ensure the availability of consultancy services for start-ups. Furthermore, the emphasis should be placed on effectively communicating to start-ups the prospective benefits entailed in utilizing consultancy services in order to encourage them to seek professional advice whenever necessary and not to try to administer areas that could be more professionally handled by consultants.

As both the literature review and the empirical study suggest, the prevailing attitude in Finland is that aiming at large and risky but possibly high-yielding prospects is not appreciated. This is a problem that cannot be affected by a simple recommendation, but is something that is deeply enrooted in the culture. However, this is an issue that should be publicly discussed. Only by acknowledging the absurdity and harmfulness of this issue can any improvement in this area take place.

5.5 Suggestions for Further Research

The topic of this thesis is something that has not been widely researched, taking into account the specific nominators combined in this study: Finnish high-tech start-ups and disruptive innovations. Acknowledging the problems related to finding case

companies – which had a negative effect on the prospects of data acquisition for the empirical part of the study – it would be beneficial that this research continued. Perhaps it would be necessary to lightly modify the nominators – such as to study disruptive start-ups from also other industries than high tech – to improve the prospects for finding case companies, or to completely change the research strategy to exclude case studies. However, this is a very momentous topic that would be intriguing to see further researched.

As realized in the aftermath of this research project, it would have perhaps been beneficial to include an interview with an investor into this study: it could have aided in obtaining deeper insights into the problems related to the early-stage funding of disruptive start-ups. As the lack of early-stage funding is one of the main challenges faced by disruptive high-tech start-ups in Finland, it would be of considerable interest to see a further study focused on this specific issue.

Furthermore, as the research suggests that utilizing consultancy services in areas that the start-up establishers are lacking skills can have a positive effect on the business, it would be newsworthy to investigate this topic area further. Specific areas of interest are the usage rate of consultancy services by start-ups, factors that positively or negatively affect the usage of consultancy services, and how does the utilization of consultancy services more specifically affect the success of the start-up.

Moreover, another fascinating question is the existence of possible correlation between disruptive innovation and growth, and the strength of the correlation. As already discussed in the introduction chapter of this thesis, there is no waterproof classification available concerning which innovations can be categorized as disruptive for statistical purposes, which makes it impossible to compare the amount of disruptive innovations between countries and lead straightforward conclusions concerning disruptive innovations' effect on the existence of high-growth companies in different countries. Therefore, it cannot be blindly assumed that there is positive correlation between disruptive innovation and the ability for companies to grow large fast. However, as already established earlier, research exists suggesting that

new ventures are expected to fail in launching sustaining innovations, but to succeed in launching disruptive innovations (see Raynor 2011, 3-5). Accordingly, taking this into account and also the evidence that disruption can lead to high growth (see Christensen 2007), it cannot either be stated that there may not be any linkage between disruptive innovation and growth. This question – the existence of possible correlation between disruptive innovation and growth, and the strength of the correlation – is a momentous subject matter and taking into account the significance of establishing an answer to it, this question would without hesitation offer fruitful and intriguing grounds for further research.

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APPENDICES

Appendix 1. Questions for the Expert Interview

Interviewee: Director Tuomas Maisala, Spinno Enterprise Center

Friday 30 August 2013 at 9:30 a.m. Time: 60 minutes.

1. Approximately what proportion of Finnish high-tech start-ups can be defined as disruptive? Of those, what proportion is successful?
2. How is the availability of funding in Finland for high-tech start-ups with disruptive innovations? How would you compare it with the funding of other start-ups (with sustaining innovations)?
3. How would you evaluate the Finnish innovation system from the viewpoint of disruptive start-ups? How does it serve them?
4. What are the incentives for growth entrepreneurship in Finland? Do they apply to disruptive start-ups?
5. What are the growth expectations of disruptive high-tech start-ups compared to other start-ups?
6. Do the disruptive high-tech start-ups have competitors? Do they compete with main markets?
7. Are the high-tech disruptions generally directed towards the low-end or new markets in Finland?
8. How does the marketing of disruptive high-tech innovations differ from marketing of sustaining high-tech innovations?

9. What is the amount of market research done by disruptive high-tech start-ups compared to start-ups with sustaining innovations?
10. How do disruptive high-tech start-ups cope with the risk and uncertainty about unknown markets?
11. How do disruptive high-tech start-up entrepreneurs tolerate failure? Is there iterative learning?
12. How is creativeness utilized in Finnish high-tech start-ups?
13. People are more flexible as organizations. How is the flexibility utilized in disruptive high-tech start-ups?
14. In your viewpoint, what are the main challenges faced by Finnish high-tech start-ups pursuing disruptive innovations?
15. How do these companies successfully overcome the challenges?

Appendix 2. Questions for the Case Study Interview

Interviewee: One of the establishing members of the case company

Thursday 5 September 2013 at 5:00 p.m. Time: 60 minutes.

1. -- How did the background of the establishing members affect the birth of the company?

2. Did [the case company] have a goal from the very beginning of becoming a large international business?

3. In the beginning, did you obtain external financing or support (e.g. from Tekes)? Was funding easily available?

4. What has been the role of external funding in the success story of [the case company]? How have you managed with the growth expectations placed by the financiers?

5. How much market research did you conduct before launching the product? How did the unfamiliarity of the markets affect it?

6. --Did the timing of the product launch have an impact on your success?

7. --

8. Does [the case company] have competitors? Is your product directed towards lower price classes (compared to the competitors) or towards new markets?

9. -- What has been the role of the hired professional CEO (and other business experts) in where the company is today?

10. Are the opportunities for utilizing creativeness in a grown organization better or worse than in the beginning of the business story?

11. What have been the biggest challenges in [the case company's] journey from start-up into a growth business? How have those challenges been overcome?

12. What is the secret or most central factor in the success of [the case company]?