Are Swedish venture capitalists stuck in the past?

An explorative study on Swedish venture capitalists' position in the funding landscape of new technology-based firms

JOAKIM LARSSON
CHARLOTTE FAHNEHJELM
Are Swedish venture capitalists stuck in the past?

by

Joakim Larsson
Charlotte Fahnehjelm

Master of Science Thesis TRITA-ITM-EX 2018:326
KTH Industrial Engineering and Management
Industrial Management
SE-100 44 STOCKHOLM
Är svenska venture kapitalister fast i dåtiden?

Joakim Larsson
Charlotte Fahnehjelm
Abstract
Currently, there are indications that Europe is facing an innovation deficit. The main explanation to the lack of innovation is considered to be that new technology-based firms are facing difficulties in receiving funding and consequently do not establish on the market. As new technology-based firms have an important role in technology development and overall growth, a consequence thereof could be a long-lasting negative effect on technological change and economic growth. The venture capital industry is frequently put forward as the actor that can provide financing for these types of firms.

This study aimed to investigate the contemporary role that Swedish traditional venture capitalists and government supported venture capitalists have in the funding landscape of new technology-based firms. To fulfill this purpose, the study analyzed both the investors’ preferences and the challenges with investing into new technology-based firms. The findings were acquired through performing eight semi-structured interviews with highly knowledgeable practitioners. In addition, literature was scrutinized. The study concluded that the preferences of the venture capital firms are heavily misaligned with investments into new technology and that digital companies present a better aligned investment alternative. More specifically, venture capitalists perceived the teams of new technology-based firms to be lacking, which is misaligned with the venture capitalists’ strong emphasis on the team. New technology-based firms were also perceived to be associated with great risks, which is misaligned with the risk aversion of venture capitalists. The high risk was found to be related to the high degree of novelty, the perceived difficulties in finding syndication partners, the venture capitalists’ lack of specific knowledge and experience, the long time to market and the large funding need in early stages. Further, the long time to market is ill-suited with the fund structure of traditional venture capital firms. On the other hand, digital companies were found to be well aligned with the venture capitalists’ risk profile and preference for investing large amounts of capital at once. When it comes to government-supported venture capitalists, the study concluded that Industrifonden’s preferences are similar to those of traditional venture capitalists and that Almi Invest, due to its structure, faces specific barriers for investing.

Based on these findings, the conclusion was drawn that the likelihood is low that venture capitalists will invest in new technology-based firms. In order to be able to draw conclusions regarding the impacts on innovation and technological change, further research on the capabilities and preferences of informal venture capital is necessary. Further research could also attend to the demand of financing to increase the understanding of the innovation deficit.

Key-words
Swedish Venture Capital, Traditional Venture Capital, Government Venture Capital, Venture Capital Investing, New Technology, New Technology commercialization, NTBFs, Investment criteria, Venture Capital preferences, NTBFs challenges, NTBFs funding landscape
Sammanfattning
Idag finns indikationer på innovationsbrist i Europa. En huvudsaklig orsak till innovationsbristen anses vara att bolag med ny teknologi har svårt att få finansiering och därmed etablera sig på marknaden. Eftersom ny teknologi spelar en viktig roll i teknologisk utveckling och ekonomisk tillväxt, är en möjlig konsekvens av innovationsbristen långtgående negativa effekter på teknologisk utveckling och ekonomisk tillväxt. Venture capital industrin framhålls ofta som en aktör som kan finansiera denna typ av bolag.

Denna studie syftade till att undersöka vilken roll svenska traditionella venture capital fonder och statliga venture capital fonder har i finansieringslandskapet av ny teknologi. För att uppnå detta syfte analyserade studien både investerarnas preferenser och utmaningarna med att investera i ny teknologi. Resultaten nåddes genom att genomföra semistrukturerade intervjuer med åtta erfarna praktiserande i industrin. Intervjuobjekten hade antingen erfarenhet från traditionellt eller statligt venture capital. Utöver detta granskades litteratur på området.


Baserat på dessa resultat konkluderade studien att sannolikheten är låg att venture capitalist interesserar i ny teknologi. Forskning på kapaciteterna och preferenser för informellt kapital är dock nödvändigt för att kunna dra slutsatser kring effekterna på innovation och teknisk utveckling. Framtida forskning bör också fokusera på efterfrågan på kapital för att förstå innovationsbristen.

Nyckelord
Svensk Venture Capital, Traditionell Venture Capital, Publikt Venture Capital, Venture Capital Investeringar, Ny Teknologi, kommersialisering, NTBFs, investeringskriterier, Venture Capital preferenser, NTBFs utmaningar, NTBFs finansieringslandskap
# Contents

List of Figures \hspace{1cm} v  
List of Tables \hspace{1cm} v  

## 1 Introduction  
1.1 Problematization \hspace{1cm} 3  
1.2 Research gap \hspace{1cm} 4  
1.3 Purpose and research questions \hspace{1cm} 5  
1.4 Delimitations \hspace{1cm} 6  
1.5 Outline \hspace{1cm} 6  

## 2 Methods  
2.1 Introduction to the research process and design \hspace{1cm} 8  
2.2 Literature review \hspace{1cm} 9  
\hspace{1cm} 2.2.1 Pre-study \hspace{1cm} 9  
\hspace{1cm} 2.2.2 Main study \hspace{1cm} 9  
2.3 Methods for data gathering and analysis \hspace{1cm} 10  
\hspace{1cm} 2.3.1 Data gathering \hspace{1cm} 10  
\hspace{1cm} 2.3.2 Sampling method \hspace{1cm} 11  
\hspace{1cm} 2.3.3 Data analysis and presentation \hspace{1cm} 12  
2.4 Discussion on research design and methods used \hspace{1cm} 12  
\hspace{1cm} 2.4.1 Validity \hspace{1cm} 12  
\hspace{1cm} 2.4.2 Reliability \hspace{1cm} 14  
\hspace{1cm} 2.4.3 Generalizability \hspace{1cm} 14  
2.5 Ethics and Sustainability \hspace{1cm} 15  
\hspace{1cm} 2.5.1 Ethics \hspace{1cm} 15  
\hspace{1cm} 2.5.2 Sustainability \hspace{1cm} 15  

## 3 Theoretical Context  
3.1 The jungle of different definitions \hspace{1cm} 16  
\hspace{1cm} 3.1.1 Innovation \hspace{1cm} 16  
\hspace{1cm} 3.1.2 New technology and technological innovation \hspace{1cm} 18  
\hspace{1cm} 3.1.3 New technology-based firms \hspace{1cm} 19  
\hspace{1cm} 3.1.4 High tech \hspace{1cm} 19  
\hspace{1cm} 3.1.5 Deep tech \hspace{1cm} 20  
3.2 Venture capital funds \hspace{1cm} 20  
\hspace{1cm} 3.2.1 The definition of venture capital \hspace{1cm} 21  
\hspace{1cm} 3.2.2 The traditional venture capital structure \hspace{1cm} 21  
\hspace{1cm} 3.2.3 The operations of traditional venture capitalists \hspace{1cm} 22  
\hspace{1cm} 3.2.4 Government venture capital \hspace{1cm} 27  
\hspace{1cm} 3.2.5 Other forms of venture capital \hspace{1cm} 29  
3.3 The VC industry in Sweden \hspace{1cm} 29  

## 4 Analysis of preferences, new technology investments and the role of Swedish VCs  

???
4.1 Preferences of venture capital investors

4.1.1 VCs seek financial return

4.1.2 VCs have shifted into preferring late stage investing

4.1.3 VCs prefer broad investments in areas within their knowledge

4.1.4 VCs invest in the promising team

4.1.5 Limited partners have limited influence on investments

4.1.6 Digital companies aligned with risk aversion and need for large capital allocations

4.1.7 Conclusions regarding the VCs’ preferences

4.2 Investments in new technology

4.2.1 The investors’ definitions of new technology

4.2.2 Investors’ attitude towards new technology

4.2.3 How investor preferences differ

4.2.4 VCs perceive the teams as lacking

4.2.5 Investments associated with compounded risk

4.2.6 VCs lack critical knowledge and experience

4.2.7 Finding co-investors is perceived difficult

4.2.8 Funding need and time to market is substantial

4.2.9 Conclusions regarding new technology investments

4.3 A synthesis: The role of Swedish VC

4.3.1 The relative attractiveness of NTBFs

4.3.2 Are TVCs and GVCs equally disinclined to investing?

5 Discussion

5.1 Supply of VC capital to nascent firms

5.2 A future VC shift?

5.2.1 Exogenous events a potential source of a VC shift

5.2.2 Policy measures to incentivize the VC industry

5.3 The role of other investors in the supply for NTBFs

5.3.1 The role of business angles and family offices

5.3.2 The potential of alternative supply sources

5.4 Demand for capital by NTBFs

5.5 Thin markets for NTBFs?

5.5.1 General implications of a thin market

5.5.2 Implication of a thin market on technology development

6 Conclusion

6.1 Conclusion on findings

6.2 Contributions

6.3 Limitations

6.4 Further research

7 Acknowledgements

Appendices

References
List of Figures

1  Relationship between technology development and growth ..... 1
2  Private equity and venture capital as illustrated by Kroksgård (2017) 21
3  The VC structure as illustrated by Da Rin et al. (2011) ..... 22
4  Development of Swedish VC ........................................... 30
5  Current VC trends .................................................... 31
6  In contrast to digital companies, NTBFs are found to be ill-matched with VCs preferences ........................................... 61

List of Tables

1  Pre-study interview data .................................................. 10
2  Main study interview data ................................................ 12
3  Stage definitions .......................................................... 25
4  Different types of exits available to a VC ............................ 27
5  Other VC actors ............................................................ 29
6  Interview questions ....................................................... 78

Glossary

BA  Business Angel.

CVC  Corporate Venture Capital.

FO  Family Office.

GP  General Partner.

GVC  Government-supported Venture Capital.

LP  Limited Partner.

NTBFs  New technology based firms.

TVC  Traditional Venture Capital.

VC  Venture Capital.
1 Introduction

New technology has throughout history been associated with giant leaps in the development of humankind. The steam engine started the industrial revolution, the combustion engine kicked off the modern era, and the Internet launched us towards uncharted territories of digitalization. Based on these examples and research it has been well documented that development of technology is a key driver of economic development and competitiveness (Schumpeter, 1961; Mowery and Oxley, 1995; Posner, 1961). Posner (1961) demonstrates this through a simple model where a technology leader which possess new technology will have an advantage over technology laggards where the size of the advantage is related to the size of the technology gap. Consequently, sustained development of new technologies is key to long term growth.

Development of technology is achieved through two dimensions; cumulative learning and active investments into R&D (Lucas, 1988; Grossman and Helpman, 1993). Grossman and Helpman (1993) argue that nations which devote a large share of their R&D are more likely than others to specialize in high-tech industries and may display faster growth. The cumulative learning process describes how technological advancement generates opportunities for further improvement. Improvements are added to the existing knowledge base and generates further improvement opportunities (Lucas, 1988). These processes does not develop technology in a linear way. Dosi (1982) among others claims that technological advancement come in waves where major technological breakthrough creates a technological trajectory during which minor or incremental innovation takes place.

![Relationship between technology development and growth](image)

Figure 1: Relationship between technology development and growth

If economic growth is to be realized, it is required that the developed technology disseminates beyond the confines of the scientific environment into society. The generalized diffusion process was conceptualized by Everett Rogers in 1962. The process starts slow and then accelerates as it reaches the early majority of the population and ultimately slows again as the few laggards remain. The speed and success of this process depends on the innovation itself but also on the adopters
and the communication and distribution channels between them. Consequently, the diffusion process can be sped up if different factors are stimulated. For example, the innovation can be tweaked to be more appealing or marketing can be performed to reach a wider population faster (Rogers, 2003).

Stimulating and increasing the rate of adoption can be performed by different actors in the economy. In terms of small newly created firms that attempt to commercialize new technology, the venture capital firm, referred to as a VC firm, is an important actor. A VC firm is uniquely positioned to impact diffusion of technology developed by nascent firms due to their business model. This is because a VC firm invests in high risk financial ventures that are otherwise unable to obtain financing through conventional public or commercial resources such as bank loans. In addition to monetary resources which can be used for activities such as further product development and marketing, VCs also provide business support such as strategic advice (Gompers and Lerner, 2004). Financial resources and advice should help the nascent firm to tweak its product or service to faster reach a larger share of the population. This is supported by research from Bertoni et al. (2011) which state that VCs have been found to strongly impact the growth of firms developing technology once they have obtained financing. In fact, Florida and Kenney (1988) argue that the specific structure of the VC helps reduce the barriers that might hinder innovation, making VCs act as “technological gatekeepers” that accelerate the process of technological change. Gompers and Lerner (2004) finds that the presence of venture capital in a region is positively correlated with the number of filed patents. From a larger perspective, Samila and Sorenson (2011) finds that VC positively impact firm starts, employment, and aggregate income in the economy further illustrating the importance of venture capital in technology development and economic growth.

Historically, the VC industry started in the US after World War II with the creation of the first formal venture capital firm: American Research and Development (ARD) in 1946. ARD was behind one of the first Information and Communication companies, Digital Equipment Company founded in 1957, which manufactured mini computers. Since then VC firms have been behind prominent technology firms such as Apple, Genentech, and Google pointing to their vital role in development and diffusion of technology (Gompers and Lerner, 2004). In Europe, the VC industry bloomed later but have still produced large tech firms such as Skype, Cambridge Silicon Radio, and MySQL (Atomico, 2017). According to Söderblom (2011), high-tech start-ups in Europe started to receive massive public interest in the early nineties and constituted the basis of a VC boom, especially in Sweden. The valuation of new technology firms skyrocketed which led to the dot-com crash of 2001 from which the industry struggled to recover from for a period of over 10 years. Since the crash, it can be argued that the European VC industry has focused more on firms commercializing incremental developments in technology such as Klarna, Avito.ru and Supercell rather than attempting to stimulate major breakthroughs. This is a concern since incremental development, although providing economic growth, follows a trajectory which eventually reaches a stagnant phase where the growth potential is diminished and returns are reduced (Dosi, 1982). Major breakthroughs are required in order to raise the ceiling and allow for continued growth. Hence, a disregard
of investments into major technology leaps have the potential to harm long term economic growth for a region or country, a concern held by our supervisor at SEB Venture Capital, David Sonnek.

1.1 Problematization

Currently, there are signals that we could be approaching a stagnant phase of the economy. Both the US and the EU reports a slowdown in economic growth (Gordon, 2012; Veugelers, 2017). In fact, Europe is currently facing an ‘innovation deficit’. In a report from 2017 to the European Central Bank, ECB, it is revealed that innovation input factors are declining or well below target levels in all of Europe (Veugelers, 2017). R&D expenditures, noted by Grossman and Helpman (1993) as important to generate technological development, has been stable at around 1% in the European Union since the start of the 21st century. This falls well below the established 3% target and is worst among all developed regions in the world. In fact, the EU has since the 1990s seen their growth rates slow more relative to other major economies such as the US (Timmer and van Ark, 2005). In addition, the R&D expenditures in the EU is unevenly concentrated with the top 10% of firms representing 77% of the total R&D expenditures. This inequality reflects a report from the Organization for Economic Co-operation and Development (OECD) which states that there is a growing productivity gap between the firms at the innovation frontier and the other firms (Andrews et al., 2008). This suggests that while technological development is taking place there seems to be an issue with the diffusion of such technologies to the wider population. Given the strong links between technology and economic growth, this is a major concern (Andrews et al., 2008; Veugelers, 2017).

The ECB report provides evidence by other authors such as Aghion et al. (2008) which state that it is the new firms that fail to play a significant role in the innovation dynamics of European industry, especially in high-tech, high-growth sectors. This is due to difficulties to enter and establish on the market and an inability to grow the most innovative disruptive young firms into world leaders. These barriers to entry and growth for new innovating firms is what ultimately weakens Europe’s growth potential.

The most frequently cited barrier for young innovative firms is the inability of the financial markets to fund the growth of new companies in new sectors. Many firms reside in the so-called ‘Valley of Death’, where initial resources have run out and they are unable to obtain additional financing (Popov and Roosenboom, 2012). Many actors regard VCs as the solution to eliminating the barriers for these young firms given their business model (Murray, 1999; Hall and Lerner, 2010; European Commission, 2009).

Interestingly, while many view VC as the natural solution and despite the presence of a developed European VC industry severe issues with financing of new technology based firms (henceforth abbreviated NTBFs) still exist (Polzin et al., 2018). The potential impact from this is unclear but a historic perspective gives cause for concern.
In the 20th century, technology developed the modern economy and created extreme growth in productivity and wealth. It gave us the automobile, the electricity and life-saving medicine. The 21st century has Facebook. The current tech industry is proficient at creating habit-forming recreational products, inspiring short and addictive dopamine kicks, rather than tackling substantial problems in society, pushing the wealth and productivity frontier. Given that VC backed the modern tech industry in their early stages (Apple, Google, Facebook etc) and continues to have an important role in the development of young new firms it is imperative to investigate and understand whether VC firms still facilitates technological development or if their investment behaviour is contributing to a stagnation of the economy.

Since VC markets differ significantly between countries with regards to stage, sector and geographical focus (Mayer et al., 2005), this thesis aimed to investigate the relationship between the new firm and VCs from a Swedish context. Since Swedish VC firm investments roughly equal the annual innovation budget of the Swedish Government their impact is likely significant on the national innovation system. Furthermore, many examples can be given that Swedish VC firms today invest in practical or incremental products based on established technology. Spotify, Klarna, iZettle are obvious examples. Whether and how Swedish venture capitalists invest into new technology has hitherto been unexplored. By fully understanding how and why VC acts and invests, policymakers will be able to better design measures that alleviate existing barriers and maximize the innovative potential of the country.

1.2 Research gap

A large volume of research within the field of venture capital has focused on the investment process of venture capitalists. Since Bruno and Tyebjee (1985), who were among the first to research the investment process and the selection criteria, a number of scholars have devoted efforts to this research area (Macmillan et al., 1985; Franke et al., 2006; Zacharakis and Shepherd, 2001; Dimov et al., 2007). A number of researchers have also been concerned with the focus of venture capitalists (Gupta and Sapienza, 1992; Norton and Tenenbaum, 1993; Mayer et al., 2005; Bertoni et al., 2015). The key characteristics of venture capital investing have also been summarized in the comprehensive book by (Gompers and Lerner, 2004). According to Mason (2009), up to date research on the industry is however necessary, since the industry is in change and existing research lack consideration of temporal context.

To a lesser but still considerable extent, VC research has looked at venture capital investments into new technology-based firms, NTBFs, or high-tech firms. Although definitions of NTBFs and high-tech vary from author to author, the commonality between both terms is that they both refer to firms which use technology that is novel (Shearman and Burrell, 1988; Arthur D Little, 1977; Butchart, 1987). The research has both looked at characteristics of new technology firms and what challenges are related to new technology investments (Lockett et al., 2002; Wright et al., 2006; Murray, 2007; Lindstrom and Olofsson, 2001; Sjögren and Zackrisson, 2005;
Landström, 2017). However, Colombo et al. (2010) argued that a greater understanding for the determinants for VC to back high-tech firms is necessary. It is also argued that much research is conducted in the US context, which is significantly different from other markets (Colombo et al., 2010). Further, Knockaert et al. (2010) contended that many researchers use investment in technology but do not describe how technology investing is different from traditional investing.

While research has addressed both the VCs’ preferences and, to some extent, investments into new technology-based firms, there is a lack of research that have taken a holistic approach and examined the alignment between the preferences of VCs and the characteristics and challenges associated with NTBFs. The alignment is important as it might help to overcome or strengthen the barriers that exist into investing into NTBFs. That is, if the current preferences of VC firms is aligned with the characteristics, the VCs might still be inclined to invest despite unfavorable characteristics. However, if the preferences do not match, the barriers to investing in NTBFs are likely strengthened. As noted above, plenty of research has focused on either side but to the extent of our knowledge no research has attempted to synthesize these two perspectives to understand the financing dynamics. Given this, and considering the criticism that venture capital literature has received (Mason, 2009; Colombo et al., 2010; Knockaert et al., 2010), our study aimed to fill the research gap by first delineating what preferences Swedish traditional VCs (TVCs) and government-supported VCs (GVCs) have when making an investment decision and what they consider is the challenges with and characteristics of NTBF investments. Based on the investment preferences, the perceived challenges and characteristics of NTBFs, the thesis attempted to outline what position Swedish TVCs and GVCs have in the funding landscape for NTBFs. By position it is referred to whether TVCs and/or GVCs are a significant player regarding these types of investments or not.

1.3 Purpose and research questions

The purpose of this thesis is to provide understanding of the Swedish VCs’ position in the funding landscape of new technology based firms. By position it is referred to whether Swedish VCs invest actively, occasionally or rarely into NTBFs. In order to achieve the purpose of this study, the thesis aims at both understanding what preferences that drive the investments by Swedish TVCs and GVCs today and what challenges come with investing into NTBFs. Thus, the following research questions are formulated:

RQ. What is the position of Swedish TVCs and GVCs in the funding landscape for new technology based firms?

Sub-RQ1. What preferences do Swedish TVCs and GVCs have when investing?

Sub-RQ2. What challenges do Swedish TVCs and GVCs face when investing in new technology-based firms?
Based on these two parts an understanding is developed of how the preferences are aligned with the challenges that come with investing into NTBFs and what that implies for the position in the funding landscape.

1.4 Delimitations

The focus of the current thesis is to understand the Swedish VC industry. The decision to focus explicitly on this market is to ensure that the scope is reasonable and that the findings within this thesis is to be relevant for researchers, policymakers and industry actors alike.

As stated in the purpose, the current study aims to understand the behavior of TVCs, that have financial objectives, and GVCs, that have both financial and political objectives (Colombo et al., 2016). Thus, this thesis excludes other stakeholders which may have an impact on investments into new technology. For example, other types of venture capital includes corporate VCs (CVCs) (Colombo et al., 2016) and informal venture capital such as business angels (BAs) (Kroksşård, 2017). See section 3.2.5 for a brief overview of these actors.

The main reason for this delimitation is that including the behavior of all major stakeholders is considered to be too large of a scope given the time and resources. For instance, CVCs typically have a strong strategic focus which dominates their preferences (Ivanov and Xie, 2010). Identifying common preferences would likely have been a difficult and time-consuming task. Likewise, the informal venture capital is fragmented, as it is made up of many different individuals, why it also is deemed difficult to synthesize their behavior within the given time-frame. Nonetheless, CVCs and BAs have the potential to be significant players in the funding of new technology-based firms, which is discussed in section 5.3.

Institutional investors, which are the investors into traditional venture capital funds (Da Rin et al., 2011), are also excluded in this study. As the institutional investors do not invest directly but invest into the funds set up by TVCs, the TVCs are deemed to be able to provide us with information to gauge their impact without having to look at the institutional investors directly.

Lastly, in this study, international TVCs that invest in Swedish companies are excluded due to accessibility reasons.

1.5 Outline

The thesis proceeds as follows. Section 2 covers the research design, the method for gathering empirical data and literature as well as the method for analyzing it. The section also includes a discussion on how the research design has affected the study’s generalizability, validity and reliability. Section 3 is a theoretical context aimed to provide the reader with the contextual information needed to understand the empirical material. The section includes a discussion of the concept of new technology, an
introduction to the operations of a venture capital firm and a description of Swedish venture capital market. Section 4 presents our empirical material and our analysis in which the quotes from the interviewees are analyzed in relationship to existing literature. Section 5 provides a discussion regarding the presented material and the analysis. In this section, additional insights acquired during the thesis are presented to further the discussion. Section 6 concludes the paper and includes a discussion regarding the thesis contribution, areas for further research and limitations of the study.
2 Methods

This section presents and discusses the methods used to collect the data necessary to answer the research question. In section 2.1, the research design and approach for gathering data is presented. Section 2.2 and section 2.3 gives thorough descriptions of how the literature review was conducted as well as how the empirical data was collected. The section ends with a discussion on the research designs effect on validity, reliability and generalizability. This section also covers a discussion on alternative research methods.

2.1 Introduction to the research process and design

This study was initiated after a request from David Sonnek, Head of SEB Venture Capital, a corporate VC firm. The study was divided into two parts: a pre-study and a main study. During the pre-study, the researchers familiarized themselves with the field by reading up on literature and performing an unstructured interview with a researcher in the field. For the specifics of the literature review and the interview, please see section 2.2.1 and section 2.3.

The main study adopted an inductive research process. The findings were reached through gathering qualitative data from semi-structured interviews with Swedish VCs and GVCs. In addition, an extensive literature review was performed (see section 2.2 for further details). When adopting an inductive process, the empirical study is based on the identified problem (Blomkvist and Hallin, 2015) and conclusions are drawn based on the studies of particular instances (Collis and Hussey, 2013). Inductive process are commonly used when exploring phenomenons. In contrast, deductive approaches formulate hypothesis and test these during the study (Blomkvist and Hallin, 2015). Interviews are commonly used to collect data regarding what participants do, think or feel (Collis and Hussey, 2013). In semi-structured interviews, the discussions are centered around some pre-decided topics, but are of an open nature, which allows for obtaining new ideas regarding the phenomena that is studied (Blomkvist and Hallin, 2015). For the specifics regarding the interviews, please see 2.3.

The choice of adopting an inductive approach and gathering data through interviews was based on the exploratory nature of the research questions, the complexity of the phenomena under study and the aim of providing a comprehensive understanding of the Swedish VC market and its investments. For a discussion on the implications of the chosen method and alternative methods, see section 2.4.
2.2 Literature review

2.2.1 Pre-study

During the pre-study, time and effort was put into getting familiar with research on venture capital and understanding the concept of new technology. As described in section 3.1, the initial literature review revealed that the usage of the concept of new technology was very ambiguous. Hence, it was important to base the research on the personal constructs of the interviewees, to enable them to talk freely around the subject.

In addition, significant efforts were also devoted to gathering important background information that enabled contextual understanding. Gathering contextual data is of special importance for studies that use qualitative data, as this data needs to be understood from its context (Collis and Hussey, 2013). The contextual data was gathered through reading news, reports from consultancy firms, the industry association and agencies under the Swedish Government.

2.2.2 Main study

During the main study, a more extensive and focused literature review was performed. As advised by Morse (1994), the researchers maintained a distance to the research in order to make sure that new discoveries were not hindered by preconceptions of the field. Instead, literature was read up on in parallel with the gathering and analysis of the empirical material. In other words, the empirical material guided the literature review. This is a common approach in inductive research (Blomkvist and Hallin, 2015). As a consequence, the understanding of the field was gradually enhanced throughout the process and was dependent on the outcome of the interviews.

As the phenomena under study was very complex, many different fields were read up on during both the pre-study and main study. During both parts of the literature review, the databases that were primarily used were KTH Royal Institute of Technology’s database Primo, Google Scholar, ScienceDirect, and JSTOR. Key-words that were searched upon during the course of this study include: “venture capital”, “radical innovation”, “incremental innovation”, “technology development”, “R&D”, “investment pattern”, “Swedish venture capital”, “investment rationale”, “investment decision”, “investment criteria”, “investment process”, “government venture capital”, “investment challenges”, “new tech”, “new technology”, “high technology” “high-tech”, “new technology-based”, “technology-based”, “innovation risk”, “technology risk”, “market risk”, “agency risk”, “risk management”, “technological change”, “long waves”, “financing barrier”, “deep technology”, “deep-tech”, “funding gap”. Similar variations and combinations of the key-words were also searched for.

After having found an relevant article, other publications by the same author was searched for. Moreover, the references of the publications were briefly reviewed.
2.3 Methods for data gathering and analysis

2.3.1 Data gathering

As described in section 2.1, interviews were performed during the pre-study and the main study. During the pre-study, one interview with a researcher in the field was held. The purpose of the interview with the researcher was to get an introduction to the field and to refine the problem. The interview, which was conducted in the very beginning of the study, was of an unstructured nature and was conducted over Skype.

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Length</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hans Landström</td>
<td>Researcher</td>
<td>65 min</td>
<td>19/2 2018</td>
</tr>
</tbody>
</table>

Table 1: Pre-study interview data

During the main-study, eight interviews with practitioners in the field were performed. The interviews were of a semi-structured nature, meaning that topics of interest had been prepared, but that other questions were developed as the interview evolved (Collis and Hussey, 2013). The open nature of the interviews allow for obtaining new ideas regarding the phenomena under study (Blomkvist and Hallin, 2015). This is in line with the exploratory aim of the study. Semi-structured interviews are appropriate in situations where it is necessary to understand the personal constructs of the interviewees (Easterby-Smith et al., 2012). This was of special importance in this thesis as the concept of new technology is ambiguous (see 3.1 for an elaboration on the various definitions).

The questionnaire that had been prepared before the interviews is included in Appendix. The questions asked were of three different types. The first type of questions was classification questions. These types of questions aim at collecting data about the unit described (Collis and Hussey, 2013). For example, the interviewees were asked questions regarding their experiences and regarding the focus of the funds. Afterwards, questions followed that aimed at understanding the interviewee’s personal construct of new technology and their perception of the characteristics of new technology-based firms. The remainder of the questions asked were directly or indirectly related to the preferences of the VCs or the challenges of investing into NTBFs. Some of the questions asked were of direct nature and probed the VCs regarding their preferences or the perceived challenges with NTBFs. The other questions explored potential underlying factors for the preferences or challenges. For example, the interviews discussed the state of the industry, the dynamics of syndication and the structure of a VC fund and related these to investments into new technology. These topics had been derived from the initial literature review. The vast majority of the questions were open-ended, which encouraged the respondent to think and reflect and provide long, developed answers (Collis and Hussey, 2013). During the interviews, both researchers asked follow-up questions to further explore the interviewee’s answer.
During the interviews, one of the researchers led the interview, while the other was responsible for taking notes. All interviews were conducted in Swedish and were documented through recording. All participants agreed to participate without being anonymous. To state the name and position of the participants in the thesis report was deemed important for the contextual understanding. The interviews with the practitioners were conducted at the workplace of the respondent or at the headquarters of SEB. Seven of the interviews were conducted in Stockholm and one in Gothenburg.

2.3.2 Sampling method

As described above, the interviews were focused on exploring the preferences, attitudes and opinions of TVCs and GVCs, and how these have changed over time. Hence, it was necessary to conduct interviews with practitioneers that had significant experience of the field. Thus, founders, partners and senior investment managers were considered to be of greatest interest for the study.

As a starting point, participants within David Sonnek’s and the researchers’ personal network were contacted. Thereafter, the sample was extended through asking respondents if they knew anyone else with relevant experience, which is known as snowball sampling (Collis and Hussey, 2013). Snowball sampling is a preferred sampling method when it is critical that the interviewees have experience of the phenomenon (Collis and Hussey, 2013).

Some participants that were contacted did not answer or declined to participate due to limited availability. This was not surprising, as other researchers have suggested that the population is difficult to contact and reluctant to participate (Shepherd and Zacharakis, 1999). Due to the time constraints, the decision was taken to move on with respondents that were available at the time of the study. This sampling method is known as convenience sampling (Collis and Hussey, 2013). The lion share of the practitioners that declined participation were still active investors.

Before the interviews, information regarding the respondents and the organizations that they had experience of was gathered. This was primarily done through reading news regarding the interview subjects and the venture capital funds. The funds’ webpages and the professional networking site LinkedIn was also read.

In the table below is a short summary of the interviewees and their experiences. For a more thorough description of the respondents and their organizations, please see Appendix. The code in the very first column will be used when referring to the interviewees throughout the remainder of the thesis.
### Table 2: Main study interview data

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Role</th>
<th>Time</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Per Anell</td>
<td>Investment manager at GVC</td>
<td>50 min</td>
<td>180319</td>
</tr>
<tr>
<td>2</td>
<td>Johan Crona</td>
<td>Former investment manager at GVC</td>
<td>70 min</td>
<td>180221</td>
</tr>
<tr>
<td>3</td>
<td>Dag Sigurd</td>
<td>Former investment manager at GVC</td>
<td>75 min</td>
<td>180208</td>
</tr>
<tr>
<td>4</td>
<td>Staffan Helgesson</td>
<td>Founder and partner of TVC</td>
<td>35 min</td>
<td>180209</td>
</tr>
<tr>
<td>5</td>
<td>Staffan Ingebourn</td>
<td>Founder and partner of TVC</td>
<td>60 min</td>
<td>180228</td>
</tr>
<tr>
<td>6</td>
<td>Magnus Melander</td>
<td>Founder and former partner of TVC</td>
<td>65 min</td>
<td>180219</td>
</tr>
<tr>
<td>7</td>
<td>Johan Hernmarck</td>
<td>Founder and partner of TVC</td>
<td>60 min</td>
<td>180228</td>
</tr>
<tr>
<td>8</td>
<td>Lennart Jacobsson</td>
<td>Founder and partner of TVC</td>
<td>70 min</td>
<td>180306</td>
</tr>
</tbody>
</table>

The number of interviews was not decided on forehand. Instead, interviews were scheduled and conducted until an empirical saturation was achieved. The relatively small number of interviews was a consequence of the fact that the respondents had significant experience in the field and gave content-rich answers.

Due to the complexity of the phenomena under study, the interviews resulted in a large amount of data that was analyzed.

#### 2.3.3 Data analysis and presentation

After the data was collected, the material was transcribed within 24 hours and reduced. As advised by Collis and Hussey (2013), the data was reduced through discarding, simplifying, summarizing and reorganizing. When sorting the data, a thematic analysis was conducted, meaning that the empirical material was sorted into categories that were based on the preferences and barriers that emerged (Blomkvist and Hallin, 2015). As the interviews were conducted in Swedish, all quotes that were to be used in the final report had to be translated. To make sure that the overall meaning of the statement was conveyed correctly, the respondents were given the opportunity to read and give input on the translated quotes.

As the aim of the study was to increase understanding of complex phenomena of investing in new technology and not statistical analysis, the empirical material was analyzed and presented in a way that focuses on the multiplicity and complexity of the phenomena.

#### 2.4 Discussion on research design and methods used

##### 2.4.1 Validity

Validity refers to the extent of which the results reflect the phenomena under study (Collis and Hussey, 2013). According to Collis and Hussey (2013), validity is generally high for studies that, just like ours, use qualitative methods and semi-structured interviews as it allows for rich and comprehensive understanding (Collis
and Hussey, 2013). However, researchers within the VC field criticize interviews and other post-hoc methods, which are methods that rely on self-reported data on the past. The critics argue that these types of studies produce biased results (Shepherd and Zacharakis, 1999). In further detail, Zacharakis and Meyer (1998) suggest that the research based on post-hoc methods is biased as VCs seldom grasp their own decision-making process, as they during it face an information overload which impedes insight into the process. Zacharakis and Meyer (1998) adds that a consequence thereof is that these studies put emphasis on a multitude of factors that only have limited influence on the decision, thus understating the most important criteria and overstating the least. Further, Sandberg et al. (1988) suggest that post-hoc methods may be subject to biases as the respondents have difficulties in recalling the true explanation and tend to rationalize their behavior. These biases is believed to hinder respondents’ introspection (Fischhoff, 1982). Real-time methods, where information is collected when the decision is made, are on the other hand believed to eliminate these biases and increase validity (Shepherd and Zacharakis, 1999). Two examples of real-time methods that are advocated by VC literature is protocol analysis and conjoint analysis. In conjoint analysis, the respondents evaluate a constructed profile, from which insights regarding the decision process is drawn. However, this research method is argued to be suitable for theory testing research only. In contrast, protocol analysis, is put forward as a well-suited technique for exploratory research (Shepherd and Zacharakis, 1999). In protocol analysis, the VC is asked to think out loud when evaluating a real proposal (Sandberg et al., 1988). Protocol analysis can be compared to case studies, which can be described as the study of a single case in its real life context (Collis and Hussey, 2013). The general disadvantages associated with case studies are that it can be difficult to find a suitable case and that the research is time-consuming (Collis and Hussey, 2013). For this reason, and since it was deemed unlikely to get access to the sensitive investment process, protocol analysis was not considered a viable method to use in the current study.

Furthermore, the validity of this specific study can be questioned due to the chosen sample. As described in section 2.3.2, interviews were held with respondents with presumable significant experience in the field. However, some of the these were not involved in fund raising or investing any more, why their insight into the current industry dynamics can be questioned. This is important to keep in mind and poses a limitation to our study.

One could further argue that the fact that the respondents weren’t given anonymity could have had a negative impact on validity, as anonymity encourages greater freedom of expression (Collis and Hussey, 2013). Similarly, one may be inclined to believe that the recording of the interviews would have an affect on the responses. However, during the interviews, the respondents seemed unaffected by the chosen approach not to offer anonymity and to record the interviews.

In this thesis respondents themselves define what they mean by new technology. This could lower validity since their perception regarding challenges of NTBF's is based on the construct of what new technology is. Hence, this thesis presents different theoretical constructs as well as the comments made by the participants surrounding
new technology in order to enable the reader to understand the context in which the other comments are made.

2.4.2 Reliability

In contrast to validity, reliability refers to whether or not the phenomena has been studied in the right way (Blomkvist and Hallin, 2015). Reliability is considered to be high if a repeat study creates no differences in the results (Collis and Hussey, 2013). Although the researchers consider it highly questionable that another study could produce the exact same results, the structured and well-documented process of this study at least enable other researchers to conduct a similar study, positively impacting reliability. However, the fact that the study has been dependent upon the network of the client and researcher has a negative effect on reliability, as future researchers may not have access to the same network. To mitigate this as much as possible information regarding the interview subjects was included both in Appendix and in 2.3.2. What justifies the snowball sampling approach is that the researchers there through got access to interviewees with presumably high knowledge within the field, which enabled high validity.

2.4.3 Generalizability

Generalizability refers to whether findings from a sample can be generalized to the entire population or to other contexts (Collis and Hussey, 2013). There are two types of generalizability that one can discuss: the statistical and the analytical generalizability. Statistical generalizability refers to the ability to assert that the findings from the studied cases, with a certain probability, is applicable to the entire population. Analytical generalizability refers to the discussion on whether or not the findings may be applicable to other cases (Blomkvist and Hallin, 2015). As described in 2.1, this study did not aim for a random sample on which statistical analysis could be performed. For this reason, it is only relevant to discuss if the results could be extended to all Swedish TVCs and GVCs or to other context such as TVCs and GVCs on other markets.

For the findings to be generalizable to all Swedish TVCs and GVCs, the rest of the industry need to be similar to the interviewed VCs. What earlier research suggests, is that venture capitalists are very heterogeneous and have very different preferences (Franke et al., 2006). This implies that one should be careful when generalizing the findings from the current study. Interestingly, as presented in section 4, the respondents in this study to a very large extent agreed with each other even though they had experiences from different types of VCs. This indicates that the findings of this thesis can be generalized to other VCs. However, as literature contends that there are large differences between VC investors on different markets Mayer et al. (2005), generalizing the findings of this study to other national contexts should be done with caution. Due to the continuous development of the Swedish VC market, one should also be cautious when transferring these findings to other temporal con-
texts. However, that this study has had a historical perspective should facilitate the assessment of what findings are applicable in a future scenario.

In order to give the readers a possibility to assess the analytical generalizability themselves, a thorough description of the interview objects and the organizations they have experiences of was included in Appendix.

2.5 Ethics and Sustainability

2.5.1 Ethics

This thesis has followed the Swedish Research Council’s guidelines for ethical research (Vetenskapsrådet, 2017). Specifically guidelines pertaining to social sciences have been followed, focusing on the conduction of interviews. This thesis have followed four guidelines related to interviews:

- **Information**: The purpose of the research was clearly stated to the participants, including who the commissioner of the study was.
- **Consent**: Participation in the interviews was done on a voluntary basis. No participant was coerced into giving an interview.
- **Confidentiality**: Participants were asked if they wished to remain anonymous or not.
- **Good use**: Information collected from the participants has only been used in this thesis and not in any other context.

In addition, every participant received the opportunity to review and agree to the quotes used in the thesis. No quote has been used without the approval of the participants.

2.5.2 Sustainability

Sustainability can be evaluated from three perspectives: environment, social, economic. Due to the nature of this thesis, environmental sustainability has not been addressed. However, this thesis is within the scope of social and economic sustainability as it aims to investigate whether NTBFs that diffuse new technology are supported by VCs or not. As described in Section 1.1, commercialization of new technologies is of great importance to achieve economic and social sustainability. This thesis thus gives understanding to one of the many roadblocks that lies ahead in the path to a more sustainable world.
3 Theoretical Context

The purpose of this chapter is to provide the reader with the context necessary to understand the answers provided by the VC firms and the following analysis. First, innovation, new technology and other related concepts are introduced. Second, the reader is given an introduction to the necessities regarding processes within the VC firm. Finally, an introduction to the Swedish VC industry is given.

3.1 The jungle of different definitions

Purpose of this section is to introduce the reader to different concepts surrounding innovation and new technology. The aim is to give the reader a toolbox from which to better understand what VC firms refer to when they talk about new technology based firms.

As described in 1.3, this thesis wants to understand the challenges surrounding the firms that develop and commercialize new technology (NTBFs), as perceived by the VC firms. However, what became apparent when reviewing literature is that the concept of ‘new technology’ is ambiguous and thus by extension the term NTBFs (Researched constructs of NTBFs found in 3.1.3). Furthermore, there are several related constructs, such as ‘innovation’ and ‘high-tech’, that are also used ambiguously (see Garcia and Calantone (2002)). For this reason, this thesis does not depart from any previous definition of new technology, but rather from the constructs of the respondents. However, what is recognized, is that an outline of some definitions of innovation and technology terms might help the reader to a more nuanced baseline from which to view the answers given by the interview subjects.

3.1.1 Innovation

Innovation was first defined by Schumpeter in 1911 as the commercialization of a new idea. In contrast, Schumpeter defined invention as the creation of new ideas (Schumpeter, 1961). Since then, many researchers have been occupied with analyzing the characteristics and dynamics of innovation (Perez, 2010). With this research, new innovations terms, such as radical, discontinuous and incremental, that attempt to describe different type of innovations have emerged. The definitions of these terms differ significantly among authors (Garcia and Calantone, 2002). This section does not attempt to provide all innovation terms and their definitions, but rather give a brief introduction to selected terms and definitions.

Two terms that are frequently used in literature describe innovations are radical and incremental innovations (Dutton and Dewar, 1986). The terms have however been defined in numerous fashions, mostly focusing on the effect of the technology. For example, radical innovations are often described as causing discontinuities, being catalysts for the emergence of new markets and industries (Garcia and Calantone,
Similarly, Perez (2010) notes that radical innovations inaugurate an innovative space in which incremental innovation follows, a concept similar to Dosi’s technological trajectories (Dosi, 1982). As suggested by Perez (2010), the space in which the incremental innovations take place is decided by the technological paradigm, which Dosi (1982) describes as the tacit agreement on what is considered to be an improvement. However, a distinction Perez (2010) makes is the one between radical innovation and technological revolution, where technological revolutions are described to be a “set of interrelated radical breakthroughs” that transforms economy and society as a whole, constituting a great surge of development. Similar to the concept of great surges are Kondratieff’s and Schumpeter’s notion of long waves (Kondratieff and Stolper, 1935; Schumpeter, 1961). According to their definitions, long waves are cyclical economic up- and downturns that occur approximately every 50 years. While Schumpeter sees technological revolutions as the causal factor, Kondratieff does not ascribe the wave to any particular factor but acknowledge that the development of technology is part of the rhythm. According to Perez (2010), the core of the revolution is basic scientific and engineering principles. As an example, she suggests that the current digitalization process is an example of a technological revolution. Like Carlota, Rotolo et al. (2015) calls to attention that radical innovations necessarily do not have to have a prominent impact on the society and economy, but rather could have a significant impact within a small niche. Variations of radical innovation involves it being a ‘risky’ departure from existing practice (Anderson and Tushman, 1986), that it originates due to perceived problems with current solutions (Utterback and Kim, 1985), or that it creates a new market (McDermott and O’Connor, 2002). Incremental innovation is on the other hand the new products, services and industries that follow the trajectory and innovative space that was created by a radical innovation (Dosi, 1982; Perez, 2010; Norman and Verganti, 2014). Variations of incremental innovation involves it being ‘easy’ or ‘simple’ with a low degree of new knowledge (Dutton and Dewar, 1986), or that it introduces new things through existing technology on existing markets (Garcia and Calantone, 2002).

Another concept that holds similarities with the given definitions of radical innovation is discontinuous innovation, which Tushman and Anderson (1986) define as innovations that signal a break from established products and the start of a new era. An alternative definition that Rice et al. (1998) provide is that discontinuous innovations give either a significant increase in performance, a decrease in cost or offers new-to-the-world features (Rice et al., 1998).

Alternative innovation terms that also focus on the effect of the innovation is disruptive and revolutionary innovation. A disruptive innovation is often a straightforward application of known technology within an established market that disrupts incumbents on the market through simplification of established products and processes (Christensen, 1993). A revolutionary innovation that enters a market implies a destruction of the technological capabilities of the incumbent firms but the preservation of market knowledge (Abernathy and Clark, 1985). In other words, a revolutionary innovation is not compatible with previous technological capabilities but it does not change the market in a way that new knowledge is required to understand it.
In their research, Sood and Tellis (2005) criticize the above mentioned innovation terms for focusing on the effect and not the characteristics of the innovation. Instead, Sood and Tellis (2005) defined three terms that rather place characteristics of the innovation in the center of attention. First, they define platform innovation, or technology innovation, as a new technology based on scientific principles distinctly different than the principles underlying other technologies. Sood and Tellis (2005) goes on to define component innovation as the uses of new components or materials within the the same technological platform. Furthermore, they describe design innovation as the reconfiguration of these components to produce better results. The last definition is similar to the concept of incremental innovation as described above.

A last interesting note regarding innovation is that there often is a significant time lag between the invention and the innovation (Fagerberg et al., 2005). An example of this are the many inventions of the seventeenth and eighteenth century that were not widely used until the industrial revolution at the very end of the eighteenth century (Kondratieff and Stolper, 1935).

3.1.2 New technology and technological innovation

As with innovation, literature provides an abundance of definitions on new technology. For example, Arthur (2007) defined new technology as a technology that achieves a purpose by using a new or different principle than used before, where a principle is defined as an idea or use of phenomena for a specific purpose. As an example, that air pressure falls with altitude is a phenomena, while using this phenomena to measure altitude constitutes a principle (Arthur, 2007). The definition of technological innovation given by Sood and Tellis (2005) represents a break with this notion, as Sood argue that the principles must be distinctly different from those of existing technologies. Similarly to Arthur, Adner and Levinthal (2002) argue that new technology is also generated by applying existing technology in other domains in which it was originally developed. Adner and Levinthal (2002) gives an example of how wireless communication technology was initially developed for laboratory purposes to measure electromagnetic waves. Subsequently, that technology expanded into the communication sector and enabled data transmission constructs such as Wi-Fi. Whether or not this is to be seen as an innovation or not is debated. According to (Schumpeter, 1961) this is an imitation and not an innovation, known as a technology transfer.

Other literature on new technology do not provide a definition of new technology, arguing for the fact that whether or not something is new or not is relative to the beholder and needs to be understood from the context (Rotolo et al., 2015; Dutton and Dewar, 1986). For instance, an investor might view a certain technology as new, because it recently appeared within the investor’s attention sphere. As a contrast, a scientist involved in the development process of the technology might see the technology as something old, based on well-known and understood scientific principles. Looking at the wireless technology example; it likely appeared new or
novel for customers now able to transfer their data without physical cords and wires. But for the researchers it was merely the transfer of something already well known to a different domain. This ambiguity is especially important to highlight within this thesis as the investors themselves define what they consider to be new technology or not and as there can be a significant time lag between invention and innovation.

3.1.3 New technology-based firms

A term that is fairly established in research is new technology-based firms, often abbreviated NTBFs. As with the previous concepts discussed, there is a lack of consensus on the definition of NTBFs (Cunha et al., 2013). Most scholars agree on that the expression was first defined by the consultancy firm Arthur D Little in 1977 (Arthur D Little, 1977). However, Cunha et al. (2013) argue that Cooper (1971) preceded the definition by Arthur D Little. Regardless, both articles defined NTBFs as firms that focus on the commercialization of a new invention (Cooper, 1971; Arthur D Little, 1977) while Arthur D Little added that firms should be younger than 25 years and that the commercialization involves substantial technological risk (Arthur D Little, 1977). Subsequent research has offered alternative definitions. Luggen (2004) argue that new technology-based firms are younger than 10 years, that NTBFs are in ‘high-tech sectors’ and are led by their original founders. Shearman and Burrell (1988) define NTBFs as independent firms which develop new industries. A conclusion one can draw is that research that defines NTBFs generally refer to young firms that are involved with commercialization of a new technology. What new technology is however, is left undefined in the literature on NTBFs. Much literature on NTBFs have been criticized for not giving an explanation to the term, thus leaving it unclear whether the term new refers to the age of the firm, the technology or both (Storey and Tether, 1998). In this thesis NTBFs imply a newly started firm trying to commercialize new technology, as defined by our respondents.

3.1.4 High tech

Another term that has been used in VC research since the 1970’s (e.g. Cooper and Bruno (1977)) is high-tech firms. Not surprisingly, the definition of high-tech also varies significantly. Interestingly, some definitions are strongly related to new technology and technological innovation. As an example, Malecki (1987) uses high tech as a label on firms that are founded by scientists or engineers with a focus on the development and utilization of new technology. Similarly, (Bruno and Tyebjee, 1985) describe high tech firms as delivering significant technological innovations. A few sources note that high technology should be viewed as the most advanced technology available, but does so without further elaborating the notion of ‘most advanced’ (Cortright and Mayer, 2001). On the other hand, high tech often seems to be something that is implicitly understood given that several articles use the expression but does not define it, e.g. Macmillan et al. (1987); Clarysse et al. (2007); Vohora et al. (2004). Further, there are indications that high-tech is used to label entire industries, thus being used in a broad and general term. For example, industries
denoted as high tech by Eurostat (2018) includes Information and Communications technology, Biotechnology, and Aerospace.

### 3.1.5 Deep tech

A term that is sometimes used by VC industry actors to describe novel technology (see e.g. Atomico (2017)) but that is largely ignored by scholars is deep tech. Although an established definition by scholars is unavailable, several organizations and websites have attempted to provide one. In their report, "From Tech to Deep Tech" Boston Consulting Group and Hello World define Deep Tech as disruptive solutions centered around unique, protected or hard-to-reproduce technological or scientific advances. Further, it is added that companies based on deep tech have a strong research base and lie at the crossroad of fundamental research and industrial application, thus advancing the technological frontier and facing unique challenges. Further, it is argued that the value creation of deep tech companies is based on developing new solutions, and not only by disrupting business models (de la Tour et al., 2017). The report goes on to distinguish Artificial Intelligence (AI), Internet of Things (IoT) and drones as deep technologies. UK site Techwork adds that “deep tech is often set apart by its profound enabling power, the differentiation it can create, and its potential to catalyze change” and that deep tech firms distinguish themselves from those firms that are focused on the incremental refinement or delivery of standardized technologies or only use business model innovation to create opportunities (TechWork, 2018). Based on these definitions it is obvious that deep tech shares similarities not only with the given definitions of discontinuous and radical innovation, but also with technological revolutions.

Similar to high tech, it seems as deep tech is used in a broad and ambiguous way, signaling that the technology in the industry is advanced, new or emerging in its commercial application, with its peak of maturity somewhere in the future. As an example, many principles behind AI (defined by the BCG report as a deep tech) came in the 1950’s by the works of Alan Turing, Newell and Simon among others but have recently found commercial application areas (Benko and Lányi, 2009). Atomico (2017) also assigns the deep tech label to industries such as eCommerce despite the first webshops appearing in the early 90’s with sites such as Amazon and eBay, indicating that, while not new, its maturity is in the future.

### 3.2 Venture capital funds

_In this section, an introduction to venture capital is given. To begin with, the different types of venture capital and the difference between venture capital and private equity is outlined. Thereafter, traditional venture capital and government-supported venture capital is described. Lastly, other venture capital investors are briefly presented._
3.2.1 The definition of venture capital

Before the venture capital funds are introduced, an important note to make is the difference between venture capital and private equity. Commonly, venture capital is used to refer to equity investments in young-growth oriented firms (Europe, 2018). Private equity on the other hand, is a broader term which refers to investments in firms that are not listed on the stock exchange (Europe, 2018). A private equity funds can for example be devoted to venture capital, leveraged buyout, mezzanine or distressed debt and consolidation (Gompers and Lerner, 2004). A distinction can also be made between formal private equity, where the equity contributions come from organized fund structures, and informal private equity (Kroksgård, 2017) that are conducted on a more informal basis. Venture capital is by this definition a type of private equity (Europe, 2018). However, it is sometimes the case, that venture capital is used to refer to all private equity financing (Andersson and Napier, 2007), which causes confusion in the field (Gompers and Lerner, 2004). This thesis uses the first presented definition, seeing venture capital as investments in young, growth-oriented firms.

The formal venture capital can further be divided into TVCs, GVCs and CVCs (Colombo et al., 2016). As described in 1.3, this thesis focuses on the behaviors of TVCs and GVCs, why the following section will be focused on describing these actors. To give a nuanced picture of the stakeholders that may have an impact on investments in new technology, this chapter will also introduce the other types of formal venture capital and the informal venture capital actors.

![Figure 2: Private equity and venture capital as illustrated by Kroksgård (2017)](image)

3.2.2 The traditional venture capital structure

The traditional VC firm creates funds as closed investment vehicles with the purpose of equity investing into nascent firms (Gompers and Lerner, 2004). The funds are typically structured as a limited partnerships between several investors called limited partners (LPs) and the venture capitalist called the general partner (GP) (Casanova et al., 2018). The LPs invest money into the fund and are generally not involved with the management of the fund, which is the responsibility of the GP. The LPs can serve on an advisory board but can not be too involved or risk losing their limited liability status, which ensures that they can not lose more money than they invested. Due to their limited involvement, rigorous contracts prevent the TVC from behaving opportunistically. As an example, GPs are often required to put a
small but significant percentage of the total fund size into the fund. The funds often have a limited life time, between 6-10 years, after which the assets acquired are sold, liquidated or written off. A single fund makes around one to two dozen investments and a TVC firm often have multiple funds at the same time, typically raising a fund every 2-5 years (Gompers and Lerner, 2004).

The VC firm generally receives compensation in two different ways: by a management fee and by a percent of profits accumulated from the sales of the companies the fund has invested in (Lerner and Gompers, 1999). Litvak (2009) notes that the yearly management fee often is between 2-2.5 percent of the committed capital by the LPs and that the percent of profits, or carried interest, is between 20-25 percent. Although numerous compensation constructs exist, GPs normally receive the carried interest after the LPs have received a certain rate of return first, called 'hurdle rate' (Gompers and Lerner, 2004; Litvak, 2009).

Figure 3: The VC structure as illustrated by Da Rin et al. (2011)

Given the limited partnership structure where most capital is provided by external investors, fund-raising becomes critical for the continued survival of the VC firm. Unsurprisingly, the ability to raise capital for new funds is heavily linked to previous performance. Venture capitalists with good previous track record have a higher probability of raising a new fund as well as raising larger funds, compared to other VC firms (Kaplan and Schoar, 2005).

3.2.3 The operations of traditional venture capitalists

In their comprehensive book Gompers and Lerner (2004) describes the operation of a traditional venture capital firm as an cyclical process consisting of three different components; fund-raising, investing, and exiting. Basically, venture capitalists raise funds from other investors which is then invested into companies. These companies are then developed and sold at a later stage with the aim of maximizing return (Cumming and Macintosh, 2003b; Gompers and Lerner, 2004).
The venture capital investment process can be divided into four steps; sourcing, screening & evaluation, deal structuring and post investment (Tyebjee and Bruno, 1984; Gompers and Lerner, 2004).

Sourcing is the process of finding investment opportunities. Venture capital firms can either use a proactive and/or reactive approach. In the proactive approach, venture capitalists actively seek nascent firms to invest in, for instance by attending events or by actively asking for information from other actors in the industry. The reactive approach implies that venture capitalists let firms contact them and submit their business proposals (Tyebjee and Bruno, 1984). In their article, Hochberg et al. (2007) conclude that the quality of the deals flowing to a VC firm improves as the network of the VC firm grows.

After deals have been sourced, the investment opportunities are evaluated. Evaluating investments into young new firms is generally difficult due to the uncertainty of the potential outcome. The uncertainty can be seen to mainly stem from three different categories of risk; management risk, market risk, and technology risk (Gompers and Lerner, 2004; Kaplan and Stromberg, 2001). Management risk captures the uncertainty whether entrepreneur(s) have the right capabilities or focus to successfully build a mature company (Kaplan and Stromberg, 2001). It also captures the agency problem which arises due to information asymmetries. There is an incentive for entrepreneurs to withhold detrimental information or exaggerate information that is difficult to check in order to boost the prospect of obtaining financing for their business idea. Management risk also captures other moral hazards such as when the entrepreneur is unwilling to apply themselves after capital has been committed, or threatens to leave when the human capital provided by the entrepreneur is crucial to firm success (Burchardt et al., 2016). Market risk is associated with the fact that the demand for the product is unknown to some extent while investing. The greater the market uncertainty the harder it is for the VC firm to predict the potential of the start-up (Wustenhagen and Teppo, 2006). Market risk also captures risk associated with competitors entering the market with products assimilating the product developed by the start-up or that direct substitutes appear, perhaps based on superior technology (Fiet, 1995). The third category, technology risk, is present before the start up has a working product ready to be launched on the market. It captures the uncertainty whether the entrepreneurs will be able to convert an idea into a product with superior or radically different performance than existing products on the market (Wustenhagen and Teppo, 2006). Technology risk also captures scenarios surrounding the development process, e.g. that development is unable to keep within cost and time limits.

Apart from gauging the team, product, and market, the VC firm could also assess risks associated with the exit and regulatory issues. At exit the market of potential buyers could be repressed, possibly due to macroeconomic factors, which lowers the equity value irregardless of the start-up performance (Cumming et al., 2005). Regulatory risk captures the risk of possible government interventions against aspects of the product or business model. For instance, in 2016 several European countries banned the UberPop offering that the VC-backed taxi service Uber provided (Davies, 2016).
These risks combined with the fact that raw data such as revenue and sales often are unavailable create a difficult investment environment for the VC. They have to make a decision in extreme uncertainty based on little factual information. Given this, VC firms combine both structured methods as well as unstructured, rule-of-thumb evaluation methods in their assessment of the investment opportunity. Manigart et al. (2000) notes that common structured methods such as discounted cash flow, or multiples are used by VC firms. Within these frameworks, the VC must estimate parameters such as market potential, time-to-market, profit margins, product uniqueness, and growth potential (Tyebjee and Bruno, 1984). In addition to theoretical models VCs also formally assess aspects such as investment size and fit compared to investment policy of the fund and geographic location of the firm (Tyebjee and Bruno, 1984). The unstructured evaluation methods are often related to the underlying biases and experiences that individual VCs have. Franke et al. (2006) notes that VCs prefer to invest into entrepreneurs similar to them. Previous experience of successes and failures also impacts the evaluation. In their research, Zacharakis and Shepherd (2001) finds that VCs become more confident in predicting the outcome of an investment when faced with cues or information that was present in previous successes and failures.

Apart from the interaction between the VC firms and start-ups there are a few other dynamics which impact the investments made by the venture capitalist. For instance, the LPs themselves can have preferences based on geographical aspects, certain industries, specific stage, governance and control of investments, and allocation level (Söderblom, 2011). As they provide the majority of the capital invested by the VCs their preferences can impact where and how VCs invest. Macroeconomic trends also impact investments by VCs. Gompers and Lerner (2000) claim that when there is a lot of capital available to the VCs firms the valuation of investments increases despite the success rate of firms staying the same. Consequently, economic "boom" times causes inefficient pricing, likely due to increased competition for the constant amount of "good" start-ups (Gompers and Lerner, 2000). Implicitly, over-evaluation of firms causes VCs to take on more risky investments and since the success rate stay the same, the returns for the entire VC industry becomes lower. However, it seems that only newly started VCs drive poor industry performance with lower returns while the older firms maintain their return levels (Kaplan and Schoar, 2005). Consequently, as performance and fund-raising is connected, the younger firms disappear as the funds to the industry dry up, while the older well-performing firms remain.

Conclusively, making proper evaluations becomes crucial for firms to survive. The evaluation scenario for a VC can drastically change depending on the stage the start up is in at the time of investment. From a venture capitalists perspective the development stage of a start up can be divided into four stages: pre-seed, seed, early-stage/start-up, and late-stage/expansion (Casanova et al., 2018; Bertoni et al., 2015; Wright et al., 2006). Typically, the capital invested by the VC firms is rather small in seed stages and grow significantly in the later-stages (Casanova et al., 2018). Certain VC firms only invest in specific stages due to the significant differences in firm characteristics between the stages (Norton and Tenenbaum, 1993).
Table 3 provides an overview of the different stages as described by (Casanova et al., 2018; Bertoni et al., 2015; Wright et al., 2006).

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-seed</strong></td>
<td>Capital allocated to pure R&amp;D activities. Focus on establishing a proof of concept of the product or service.</td>
</tr>
<tr>
<td><strong>Seed</strong></td>
<td>Capital allocated to market research, further product development, building management team, and developing the business plan. Seed stage firms typically have no commercial operations yet.</td>
</tr>
<tr>
<td><strong>Early-stage</strong></td>
<td>Capital allocated to begin operations. Supports further product development and initial marketing. Generally, firms have already assembled key management, made market studies and prepared a business plan. At this stage, the business could be seeing its first revenues but has likely yet to show profit.</td>
</tr>
<tr>
<td><strong>Late-stage</strong></td>
<td>Capital allocated to expand the firm rapidly. The product or service is in production and is commercially available. Focus on optimizing product and user base where opportunities may be taken to scale the product across different geographic markets. The firm is taken towards a mature state which implies bulking up on business development, sales, advertising, tech, support, and others. The company demonstrates significant growth, but may or may not be showing a profit.</td>
</tr>
</tbody>
</table>

**Table 3: Stage definitions**

VC firms investing in later-stages of a firm is often exposed to limited or no technology risk as the product typically is already developed and commercially available. Market risk is easier to evaluate in later stages since there exist initial sales data and customer responses. Given this risk profile, traditional venture capitalists increasingly prefer to invest late-stage (Bertoni et al., 2015; Dimov and Murray, 2008; Casanova et al., 2018). The trade-off of the risk being lower and easier to evaluate is that the potential return is typically lower when investing late-stage rather than seed or early-stage (Das et al., 2003). However, this does not hold for all venture capital markets. Dimov and Murray (2008) notes that returns when investing in seed and early stages are high on the US VC but that there is no such pattern in Europe. In fact, the European VC market has historically shown poor returns when investing in seed and early stages (Dimov and Murray, 2008). Consequently, the trade off might not be as large for investors operating on the European market.
This is consistent with the behaviour observed in the introduction, that European VCs have moved away from riskier technology investments.

One way for venture capitalists to reduce the risk of an investment is to syndicate the deal. Syndication implies that a VC firm with an investment opportunity invests together with other VC firms, thereby diversifying its portfolio and reducing the exposure of a single investment. Furthermore, syndication is a way for VCs to gain a second opinion from other VCs regarding the investment prospect. This is highly beneficial given the uncertain nature of these types of investments and help reduce the likelihood of failure. A third reason to syndicate for a VC firm is to gain access to other deals in the future, with other VCs as the originating party. In this way the VC can build a greater network and faster build a historic portfolio to attract limited partners in future fund-raising (Gompers and Lerner, 2004).

Staging investments is another tool that VCs frequently use to reduce risk and control for moral hazard (Gompers, 1995). Not to be confused with the development stages of a start-up, staging investments implies that VC firms portion out the capital piece by piece rather than paying everything up front. This staging is associated with conditions or goals that the start-up must achieve, giving the venture capitalist the opportunity to abandon the project if it fails to deliver (Wang and Zhou, 2004). This reduces the risk of the VC being stuck with a bad investment. The trade-off with staging the investments is the monitoring costs that arises from constantly having to measure the firms progress (Gompers, 1995). Consequently, the venture capitalists often have short stage cycles when the firm is in early stage or when performance is lagging. The cycle increases in length as the nascent firm starts to stabilize and mature (Gompers and Lerner, 2004). The staging of investments is often combined with contracts which further protects the VC. Typically these contracts are structured such that when firms under-perform, VCs gain full or near full control over the firm and give them the power to change the management team. Control and liquidation rights is relinquished to the start-up when it performs well but VCs typically retain the right to cash flow (Gompers and Lerner, 2004).

After the investment has been made, the VC moves into the post-investment phase where they attempt to provide valuable additional resources. This can include managerial education, access to expertise and human capital, and provide credibility to suppliers and distributors (Large and Muegge, 2008).

Typically the bulk of the returns generated by a VC fund comes from a few of the firms in the fund portfolio, while most firms fail to deliver little or no return at all (Gompers and Lerner, 2004). Consequently, ensuring successful exits for the few firms is key to the continued success of a VC firm. There are a number of ways in which a VC firm can exit a company; exit through an IPO, a acquisition, a secondary sale, a buyback, or write-off (Cumming and MacIntosh, 2003b).
Below is an overview of alternative exit strategies as described by Cumming and MacIntosh (2003b).

<table>
<thead>
<tr>
<th>Exit strategy</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IPO</strong></td>
<td>Publicly listing the firm on the stock market. Typically, the VC does not sell its shares at the date of the public offering but rather shares are sold over a period of months or even years.</td>
</tr>
<tr>
<td><strong>Acquisition</strong></td>
<td>The entire firm is purchased by a private third party. This can be done by a sale of shares, a merger, or by a sale of the firm’s assets. The buyer is often a ‘strategic acquirer’; acquiring the firm gives the buyer new capabilities or direct competitive advantage.</td>
</tr>
<tr>
<td><strong>Secondary sale</strong></td>
<td>The VC sells its shares in the firm to a third party, typically a strategic acquirer or another VC firm. Different from an acquisition, the VC alone sells its interest to a third party while the entrepreneur and other investors retain their shares.</td>
</tr>
<tr>
<td><strong>Buyback</strong></td>
<td>The firm is bought back by the entrepreneur(s). The buyback can be triggered by the exercise of contractual rights taken by the VC at the time of initial investment. Often triggered when the firm has failed to achieve certain performance targets, or failed to go public.</td>
</tr>
<tr>
<td><strong>Write-off</strong></td>
<td>The VC either liquidates the assets of the company or walks away from the investment, giving back control to the entrepreneurs. Often the case when the firm has failed to reach their potential and no longer justifies direct involvement by the VC firm.</td>
</tr>
</tbody>
</table>

Table 4: Different types of exits available to a VC

A IPO or an acquisition are the exits preferred by the VC firms since the potential returns are significantly higher compared to other exits (Cumming and MacIntosh, 2003a).

### 3.2.4 Government venture capital

The operations of a GVCs is very similar to the operations of a TVCs that have been described above. What contrasts the two is the ownership structure and rationale for investing (Colombo et al., 2016). In contrast to traditional venture capital,
government VCs either take the form of direct public funds or funds-of-funds. In direct public funds, the government allocates funds into government-supported VC-like schemes that aim to facilitate the development of VC industry within a specific industry or region or stage (e.g. early stages). In a funds-of-funds structure, the government invests in other investment funds rather than investing directly in companies (Colombo et al., 2016). Direct public funds often have an evergreen structure. In an evergreen fund, the returns generated by the funds is returned to the same capital pool. The fund is active as long as capital exists and the government wants to keep the VC active (King, 2008). GVCs are not exclusively guided by financial goals, but consider other investments that are not as satisfactory in terms of return for risk if these investments can generate other payoffs or benefits (Colombo et al., 2016)

The political aims of the GVCs is often an attempt to bridge certain market failures generated by the investment patterns of the VC industry. These market failures stem from the chicken-egg paradox existing in the venture capital industry; deal flow is scarce because of a shortage of equity from VCs and, at the same time, VC is poorly developed because there are few potential viable targets (Grilli and Murtinu, 2014). Murray (2007) concludes that the government often attempt to address either one side or the other of this paradox by affecting the supply or demand of equity to small firms. If the government believes the market is inefficient and unable to supply certain firms with equity, then the government use GVCs to attempt to increase the supply of equity (Murray, 2007). Several researchers show that GVCs target early stage firms and in some cases high-tech firms for investments, since governments perceive the supply available to these firms as low (Murray, 2007; Bertoni et al., 2015; Grilli and Murtinu, 2014; Gompers and Lerner, 2004). This intervention is supported by the fact that TVCs prefer to invest in later stages (Bertoni et al., 2015). However, researchers criticize these interventions by GVCs arguing that they crowd out and replace private VC actors rather than complementing the market (Brander et al., 2008; Cumming and MacIntosh, 2006). Furthermore, it is argued that GVCs are poor at picking successful investments and developing them thus leading to an inefficient use of capital (Brander et al., 2008). Their poor ability of making successful exits could be due to the boundary conditions set up by their primarily focus on early stage. Nightingale et al. (2009) and Murray (2007) notes that many GVCs are smaller in size and limited in their ability to make follow-on investments. This limitation implies that their returns are lower as their shares get diluted in following investment rounds. Combined with the high fixed costs of screening and evaluating investments, this negatively impact the effectiveness of the GVC (Nightingale et al., 2009). Another approach available to the GVCs is to affect the demand side. Possible demand side interventions by the government is outside of the scope of a GVC but could be tax reductions, education to entrepreneurs to improve their management skills, and facilitating networking among informal investors (Landström, 2017).
3.2.5 Other forms of venture capital

As described in 1.4, other forms of venture capital that receive significant attention in literature is corporate venture capital, business angels and family offices. Capital provided by family offices and business angels are often called informal venture capital (Kroksgård, 2017).

<table>
<thead>
<tr>
<th>VC Actor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business angels</td>
<td>Rich individuals that invest their own wealth into nascent firms. Often focus their financing to earlier stages due to their limited capital. Prefer to invest based on prior experience and interests. (Landström and Mason, 2016)</td>
</tr>
<tr>
<td>Corporate ventures</td>
<td>Venture capital firms which are owned by a corporation. Their goal is often to make strategic acquisitions of young firms to complement the internal R&amp;D activities of the parent company. These ventures can invest either early or late stage as long as the investment is aligned with the strategic goals. (Block et al., 2018)</td>
</tr>
<tr>
<td>Family offices</td>
<td>Investment vehicles that serve a single family of rich individuals. Can sometimes serve more than one family. Typically allocates only a smaller amount of the total wealth managed into young ventures. They are passive investors and often provide limited additional support (Block et al., 2018).</td>
</tr>
</tbody>
</table>

Table 5: Other VC actors

3.3 The VC industry in Sweden

This section gives a brief overview of the Swedish VC industry which within our VCs operate. The industry started 1970s and have undergone several highs and lows. Currently the industry is at its highest peak ever.

Swedish VC industry emerged in the middle of the 1970s, due to government initiatives aimed at reviving the Swedish economy (Karaomerlioglu and Jacobsson, 2000). Among others was Industrifonden, which was created in 1979. In mid 1980s, 30 new regional and government managed investment companies had been established and about 20 privately held VCs were operational (Olofsson and Wahlbin, 1985). However, during the financial crisis in the late 1980s with falling stock prices and high interest rates, the VC market collapsed. Part of the failure has been attributed to the lack of experience of the investment managers at the VC firms (Isaksson, 2006).
During the shake-out period, most private VC left the industry with the government directly providing 43% of all capital on the market in 1987 (Karaomerlioglu and Jacobsson, 2000). Fredriksen et al. (1997) state that the venture capitalists that remained and those formed after this shake-out period were more reluctant to invest into early stages and high technology firms, than firms prior to the shake-out period. During the 1990s, several events helped to revive the industry. In the beginning of the decade, the government created two large investment funds, Atle and Bure, which went public in 1995. In addition, direct government involvement came with NUTEK and Almi, attempting to fix the early stage passiveness of private VCs. In 1996, pension funds was first allowed to invest into start-ups with the creation of the 6th AP fund. In addition, the 1990s also saw the introduction of the limited partner structure, creating new incentives for investment managers, thus attracting better talent. These events combined with a flourishing stock market provided a capital injection into the market (Karaomerlioglu and Jacobsson, 2000; Isaksson, 2006). The capital injection came at a time when the demand side of equity shifted as well. Driven by frenetic establishment of firms based on internet technologies, this increased demand in combination with the available capital created a boom for the VC industry during the late 1990s (Isaksson, 2006). This boom saw a reverse of the early stage cautiousness displayed by the private VCs, as huge amount of capital was invested compared to previous periods (Isaksson, 2006). During this time, from 1994 to 2000 the Swedish VC industry grew by at an annual rate of 188% compared to ~35% in the US and UK (Andersson and Napier, 2007).

![Figure 4: Development of Swedish VC](image.png)

Source: Isaksson (2006)

In 2001, the dot-com crash collapsed the market and many of the new entrants vanished. Those who remained were hesitant and risk avoiding. The previously noted high interest to invest in early stages during the boom years disappeared (Isaksson, 2006). Instead, the firms fled to later stage investments, or focused on
their existing portfolio firms (Söderblom, 2012). In the decade that followed the dot-com crash the Swedish VC industry struggled both with respect to number of actors and the amount of capital raised. The number of VC firms operating on Swedish market was reduced by 65 percent (Söderblom, 2012). Moreover, the proportion of non-Swedish funds increased over time (Söderblom, 2011). Anecdotal evidence showed that the appearance of non-Nordic VC firms resulted in Swedish high-potential firms bypassing the local VC industry and directly seek international VC capital (Söderblom, 2012). Consequently, Söderblom (2012) argued that the Swedish VC industry was in a state of crisis at beginning of the 2010s with low returns, shrinking exit markets, and abandonment by institutional investors into the VC funds.

Fast forward to today and the outlook is different. Driven by a prolonged macroeconomic trend, the outlook for the European and Swedish venture markets is bright. Atomico (2017) notes that 2017 was a new record for European tech investments with $19.1bn raised. At the same time, Sweden paces all European countries regarding the amount invested per capita and have raised the third most capital of all European countries since 2012 (Atomico, 2017).

This outlook is strengthened by a report from Tillväxtanalys which states that during 2016, 2.2 billion SEK was invested in Swedish venture capital companies; a 22% increase from the year before. Focus by the VC industry seems to be investing in Life Science and Information and Communications Technology firms with 73% of the total investments made (Kroksgård, 2017). Interestingly, while the industry seems to have recovered, the aversion for early stages seems to persist. Atomico (2017) comments that the number of early deals declined in 2017 while the number of later staged deals increased. In comparison, Tillväxtanalys noted in 2016 that seed investments had increased somewhat while early stage investments had decreased (Kroksgård, 2017).
In their most recent report, Tillväxtanalys (Kroksgård, 2017) groups the current venture capital investors on the Swedish market into four categories: international, Swedish, economic-political and unidentified. Of these, the international investors are the largest. As of 2016, approximately 50% of the invested volume in Swedish portfolio companies was investments made by international funds. Approximately 20% (approx 400 million) of the investments were made by traditional Swedish venture capitalists and 30% (approx 600 million SEK) were made by government-sponsored venture capital funds (Kroksgård, 2017).

As of 2016, the government sponsored VCs included Industrifonden, Almi Invest, Fouriertransform and Inlandsinnovation. However, as of 2017, Fouriertransform and Inlandsinnovation became subsidiaries of the newly formed government VC Saminvest (Kroksgård, 2017), a fund that invests indirectly in private funds through a fund-in-fund structure. In the beginning of 2017, the fund had approximately 5 bn SEK under management. The purpose of the fund is to catalyze the forming of private VCs in areas where there is a lack of private investors. The fund has an evergreen structure and has to generate positive return after it covers its costs (Saminvest, 2018). This has left Industrifonden and Almi Invest as the only government supported VCs that invest directly into startups.

Below follows a brief introduction to Industrifonden and Almi Invest. The information has been retrieved from their respective web pages, annual reports and from the interviews.

**Industrifonden**: Industrifonden was founded by the Swedish government in 1979 with the objective of stimulating the Swedish venture capital industry. Industrifonden operates as a trust and has an evergreen fund structure. In the beginning, the focus was solely on industrial companies but have changed since into being venture capital investor with a wide scope. The firm invests across all stages and always syndicate their investments. The fund has close to tripled in size since its inception from 1.6bn SEK to 5bn SEK, following profitable exits in both technology and life science companies.

**Almi Invest**: Almi Invest was founded by the Swedish Government in 1994 to provide capital to early stage start-up companies. Currently, the GVC is made up of 8 different regional venture capital firms, covering all of Sweden. Almi Invest has a portfolio of over 400 companies with an investment rate of around 70 investments per year. Currently, the assets under management accumulate to 3bn SEK. Their focus continues to be early stage firms across all industries with good scalability and potential to compete internationally. Almi is restricted to a maximum of 10MSEK per firm they invest in.
4 Analysis of preferences, new technology investments and the role of Swedish VCs

In this chapter the empirical material is presented, analyzed and compared to the existing literature in the field. The section is divided into three parts. The first part presents the investors’ current preferences. The second describes new technology-based investments and what challenges they pose to investors. Throughout the section, the findings regarding new technology-based firms are compared to the found preferences. The last part of the section provides a synthesis of how new technology investments are aligned with the preferences of investors and provides insights on what position Swedish VC firms take in the funding landscape of new technology-based firms.

4.1 Preferences of venture capital investors

This section aims at providing deeper understanding of what type of investments and firm characteristics Swedish TVCs and GVCs prefer, thus giving an answer to the first sub-research question. The outline is as follows. In sections 4.1-4.5 the contemporary preferences of VCs that this study has identified are described. As traditional venture capitalists invest on behalf of the limited partners, the study also covered how limited partners affect the preferences of traditional venture capitalists. These findings are presented in section 4.5. The end of the section provides a description of the current target market of the VC industry, namely digital companies, and how these companies are aligned with the preferences of the VCs. 4.6 summarizes the findings, analysis and comparisons to literature.

4.1.1 VCs seek financial return

VC literature suggests that traditional venture capitalists aim at maximizing return, as this is essential to be able to raise additional funds (Gompers and Lerner, 2004). That the financial return is the primary reason when investing for traditional VCs was indicated by the respondents in the interviews:

“It’s always strictly a financial affair. I would never invest simply to learn more about a technology or a market.”

(Respondent 7, Founder and partner of TVC)

GVCs, on the other hand, are not solely focused on financial goals, but usually consider other investments that are less satisfactory in terms of return for risk if the investments can generate other payoffs or benefits (Colombo et al., 2016). As described in Section 3.3, Industrifonden aims at being a catalyst for venture capital investments in general while Almi Invest invests in early stages. Interestingly, the interviews however reveal that Industrifonden also have maximized return as their primary criterion:
“Each and every investment is compared to all other investment opportunities. You will always invest where the return is the most attractive.”

(Respondent 1, Investment manager GVC)

One explanation put forward of the GVCs’ focus on financial return was the structure of the GVCs. Although lacking limited partners demanding returns, Industrifonden’s ever green fund structure makes it dependent on growing the capital:

“VC investors need to make good investments or they will never be able to raise their next fund. We will also die if we don’t make good investments - there is no one giving us money.”

(Respondent 1, Investment manager GVC)

Similarly, it was indicated that the evergreen structure also makes Almi Invest focus on return:

“At Almi Invest, we needed to make sure to maintain our capital base. It’s a tough requirement when investing at early-stages. You need to earn a lot of money on some investment to make it work. In that sense, it was no other business than making money.”

(Respondent 2, Former investment manager GVC)

Due to the VCs’ strong emphasis on making successful exists, one may be inclined to believe that the exit market would be a deciding factor in the investment decision. For example, Gompers and Lerner (2004) contend that the concern regarding successful investments always lead the venture capitalists to investments into markets that are in the public lime-light. As will be discussed in section 4.1.6, the industry is currently targeting the industry that public investors are interested in. Interestingly, what was indicated in the empirical material was that some actors take exit opportunities into consideration when investing, while others do not have the existence of potential takers as an explicit investment criteria:

“Before entering a company, you need to make sure that you know that you will be able to exit the company and who will buy it.”

(Respondent 5, Founder and partner of TVC)

“A lot of venture capital funds take the exit market into account when investing. We don’t do that at all. We think of whether or not it can become a great, successful company. If it can be, the exit is usually not a problem.”

(Respondent 4, Founder and partner of TVC)

4.1.2 VCs have shifted into preferring late stage investing

Literature on stage preferences of European venture capitalists suggest that TVCs tend to make investments in companies that are more mature, in their later stages (Bertoni et al., 2015). Further, Bertoni et al. (2015) contends that the more risky investments in early stages are left for GVCs. However, important to note is that
literature suggest that there are substantial variations between countries in stage preferences. For example, Mayer et al. (2005) argue that the UK industry are more focused on late stage investments than the German industry. Similarly, Bertoni et al. (2015) contends that the European pattern is distinctly different from the US pattern where TVCs and not GVCs tend to make the risky investments.

Several researchers argue that European stage preferences have not been stable over time, but rather in transition due to a growing risk aversion. Murray (2007) suggests that the preference for later stages emerged in the mid 1980s as many early-stage investments failed during that time. In addition, Block and Sandner (2009) argue that the recent financial crisis made investors more risk averse. Swedish research concludes that the dot-com crash made investors flee to later stage investments (Söderblom, 2012).

Some studies argue that the reason why the industry has shifted to a late stage preference is because early stage investing has become an inappropriate activity due to increased fund sizes. As Murray (1999) suggests, fund sizes in both US and Europe have increased as successful venture capitalists have striven to capture scale benefits. As a consequence, a size-based segmentation has emerged in the VC-market place, where larger funds make larger average deals (Murray, 1999).

What came forward in the interviews, was that the Swedish venture capitalists, as literature suggests, prefer late stage investments, but that this shift to later stages has occurred over the last two decades:

“The venture industry has changed significantly. When we started, we invested at very, very early stages. But all our colleagues, such as Northzone and Creandum, that are still in the industry, are now entering at a much later stage. There are few VCs that invest in early stages.”

(Respondent 5, Founder and partner of TVC)

“A-rounds are perhaps the most difficult investment a VC can do, since so much can go wrong at that stage. From the beginning, firms such as Creandum were targeting these kinds of investments. In the beginning of the 21st century, there were 20-30 companies that were focusing on it. Today, there are barely any.”

(Respondent 6, Founder and partner of TVC)

In addition, the pre-study interview also confirmed that the Swedish investors are growth investors and that very few of the existing firms invest in early stages.  

While research suggests that GVCs ignore companies in their expansion state and specialize in companies that are in seed-stage (Bertoni et al., 2015), the interviews indicated that it only is Almi Invest that invests in very early stages.

“In the second fund at Almi Invest, we shifted our focus from early expansion phase to ‘as early as you dare’. Sometimes we even started the company with the entrepreneurs.”

---

1Respondent 10; Landström, Hans. Professor at Lund University. 2018. Skype interview 19/2
On the contrary, there were indications that the government supported Industrifonden had followed the private market’s transition to later stages.

“I have a gut feeling that we have decreased our investments in companies that just have been spun-out from universities. Rather, we look at the companies at a later stage - when they are more mature.”

(Respondent 1, Investment manager GVC)

An explanation for Industrifonden’s transition is likely that they are required to co-investment with TVCs, which have inclinations for the later stages.

Many respondents suggested, confirming the literature, that the reason for the transition was an increasing risk aversion that emerged after the dot-com crash and a need to allocate larger amounts of capital to each investment as funds grew larger:

“When raising our second fund, we realized that we needed to shift from pre-revenue investments. We realized how hard it was and how many companies failed. We needed to raise the odds and allocate more money into each company due to our increased fund size.”

(Respondent 8, Founder and partner of TVC)

“The reason why the industry has shifted to later stages is first and foremostly because of the risks. Investors are less and less willing to take on the risk in early stages; many have burnt their fingers. Secondly, it is because they have raised larger funds. They have more money to allocate, meaning that they can’t do too small investments.”

(Respondent 5, Founder and partner of TVC)

“Everyone burnt their fingers on early-stage investment in the dot-com bubble. As a consequence, the investment focus of venture capital firms shifted to investments in established companies that rather were in expansion phase than in development.”

(Respondent 3, Former investment manager at GVC)

“We shifted from early to late stages because we failed in early-stages. Also, we could not manage 50 companies at the same time. You have to increase investment sizes, reduce the number of companies.”

(Respondent 8, Founder and partner of TVC)

Even though VCs are considered to be investing more and more in later stages, respondents however also acknowledge that it is necessary for VCs to invest in early stages to get the opportunity to invest in companies that are uprising:

“Traditional VCs need to invest across stages both of branding reasons but also because they don’t want to miss any great entrepreneurs.”

(Respondent 2, Former investment manager at GVC)
“Our greatest concern is if we take enough risk. It can sometimes sound like a good strategy to wait a little, invest at a later stage, take on less risk, receive a slightly lower return. But what happens? The return will be much lower because you won’t be able to enter the winners, because there you can only enter in seed or in the A-round, so it’s a bad strategy.”

(Respondent 4, Founder and partner of TVC)

According to Dimov et al. (2007), venture capitalists that are regarded as having high status tend to be more risk averse and invest in later stages than their peers, due to a fear of losing face. This aspect was not brought up by the respondents, but as many of them had invested successfully over a long period of time, it could serve as an alternative, or complementary, explanation to the shift to later stages.

The venture capitalists preference for later stages was also apparent when discussing what needs to be in place when investing. In our material, there were strong indications that investors prefer to invest when there is already proof of concept and market acceptability, rather than engage in concept development:

“Generally, you want to have a proof of concept and some type of commercial success, such as a pilot project or a customer.”

(Respondent 3, Former investment manager at GVC)

“Traditional VCs invest in already proven concepts. They scale already successful concepts.”

(Respondent 2, Former investment manager at GVC)

In line with their focus on early-stage investments, the GVC Almi Invest seemed to have a slightly different attitude, embracing concept development:

“It helps if the company has revenue from a paying customer. It reduces the financing risk, which is soothing for an investor. It also gives us more time to figure out where we are headed and to learn and gather insights.”

(Respondent 2, Former investment manager at GVC)

Furthermore, the interviews revealed that investors find it essential to be able to assess the market potential and assess what is needed to bring the product or service to the market before investing. This further supports the notion of VCs’ risk aversion.

“Before we invest, we need to be able to assess that there is a substantial potential - that there is a need and demand.”

(Respondent 5, Founder and partner of GVC)

“Before investing, you need to have a good notion regarding the financial plan and what is required to bring the product or service to the market.”

(Respondent 1, Investment manager at GVC)
4.1.3 VCs prefer broad investments in areas within their knowledge

Studies on diversification note that VCs mainly adopt either specialization or diversification strategies. If a VC is pursuing a specialization strategy, the level of diversification is low, and the VC mainly targets a few businesses from one industry. If pursuing a diversification strategy, the VC rather targets multiple businesses across various industries (Zhang, 2014). Specialization of knowledge resources is argued to provide benefits such as helping portfolio companies operate (Matusik and Fitza, 2012). Further, a specialization strategy enables an focused network and learning across similar investments, leading to efficiency in evaluating (Green, 2004; Matusik and Fitza, 2012). On the other hand, diversified VCs are argued to be able to solve complex problems and respond to uncertainty, having the ability to shepherd a portfolio company down a variety of trajectories Matusik and Fitza (2012).

What was indicated by one respondent was that being too specialized is considered unattractive as one might lose out on attractive investment opportunities:

“You should be careful not to operate within a too narrow niche. If we had been, we would have rejected a large part of our best investments.”

(Respondent 4, Founder and partner of GVC)

Interestingly, the same respondent also put forward that too much emphasis should not be placed at a diversification strategy:

“Historically, we have sometimes tried to be “smart” regarding how to construct the portfolio. That’s the wrong strategy. It’s much better just to have the best companies. You shouldn’t think too much about portfolio diversification, but about quality.”

(Respondent 4, Founder and partner of GVC)

As a comparison, one respondent suggested that most actors within the Swedish VC industry have a diversified investment strategy:

“Many Swedish VCs are generalists, meaning that they invest in a broad range of industries.”

(Respondent 3, Former investment manager at GVC)

Another respondent suggested that the focus of the venture capitalists is affected by the knowledge of both the VC and its network:

“The focus of the fund both depends on what the market looks like but also on the people in the fund. If you are knowledgeable within one area, it is natural that you have your network there, meaning that you can compete better with other investors within this area.”

(Respondent 1, Investment manager GVC)

This notion is in line with research that suggests that VCs are more inclined to invest in domains where they have knowledge and network. Within those domains
VCs have a better ability to recognize successful investment opportunities and find support (De Clercq and Dimov, 2008).

An additional respondent added that the interest of the investment managers also may affect the investment decision:

“It’s rather subjective. You take an interest in certain areas because you as an investment manager find it exciting or because you have certain knowledge.”

(Respondent 3, Former investment manager GVC)

4.1.4 VCs invest in the promising team

What criteria VCs have when investing is something that has attracted the attention of many researchers. Macmillan et al. (1985) argue that the entrepreneur ultimately determines the funding decision, regardless of product market or financial criteria. More specifically, Macmillan et al. (1985) conclude that several of the most important decision criteria are related to the entrepreneur’s experience. For example, VCs regard it important that the entrepreneur is familiar with the target market, has a track record and possesses leadership capabilities. The latter criteria was found to be an essential one, meaning that the VCs would reject a proposal if the entrepreneur hadn’t demonstrated leadership in the past or if the entrepreneur seemed to be lacking the capability of leading the venture (Macmillan et al., 1985). Similarly, Strömberg and Kaplan (2004) conclude that the qualities of the team is a very important factor during the investment decision. In contrast to Macmillan et al. (1985), Strömberg and Kaplan (2004) find that the market more often is named as the reason for investment.

During the interviews, several of the respondents stated that they believed that the team was the crucial factor when investing:

“In the end, it’s the team that matters.”

(Respondent 4, Founder and partner of TVC)

“There is an abundance of examples of interesting ideas that never were realized because of problems with the team. So if I had to rank importance of different factors, team would be very, very high.”

(Respondent 2, Former investment manager of GVC)

“If you lacked faith in the team, it would never work. The team was the most important factor when investing.”

(Respondent 8, Founder and partner of GVC)

“The greatest challenge is almost always the entrepreneurship. It’s seldom the business idea or technology that breaks the case. Rather the greatest challenge is the technological entrepreneurship that is to evolve into mature leadership. It sounds like a cliché, but that’s why I say that invest in people. It’s crucial for me.”

(Respondent 7, Founder and partner of TVC)
“You will never succeed without a strong leadership.”

(Respondent 7, Founder and partner of TVC)

A respondent also suggested that the team is of even greater importance in early stages:

"Special emphasis is placed on the entrepreneur in early-stages."

(Respondent 8, Former investment manager at GVC)

What one respondent indicated regarding the team was that it is important that the personality of the entrepreneur matches the investors’:

“We never invest if the chemistry isn’t right.”

(Respondent 7, Founder and partner of TVC)

Yet, studies on the entrepreneurs’ personality concludes that VCs regard compatible personality as one of the least important investment criteria (Macmillan et al., 1985). However, this research has been criticized for methodological shortcomings and not taking biases into account. More recent studies on the effect of similarity bias in the investment decision conclude that VCs tend to favor entrepreneurs that they are similar to. While VCs with prior experience of working in start-ups prefer individuals that also have done so, VCs who have an engineering and managerial education tend to rate teams with these competencies higher (Franke et al., 2006).

### 4.1.5 Limited partners have limited influence on investments

Research on Swedish private equity funds suggest that the most important fund selection criteria for institutional investors (LPs) in venture capital funds is the management team’s strength (Söderblom, 2011). The notion that general partners are of crucial importance was indicated in the material:

“They [limited partners] try to find the best teams on the market that they are investing.”

(Respondent 7, Founder and partner of TVC)

Studies have showed that there is a difference in investments related to funding sources. For example, funds that are backed by private individuals or corporates are more likely to invest in earlier stages. However, the same study concludes that the source of finance isn’t what gives rise to the differences in activities (Mayer et al., 2005). In the material, it was suggested that limited partners have limited preferences regarding the focus of the fund:

“It might be so that some analyst that is to place 0.5% of the total allocation of the limited partner into a special venture fund has a discussion regarding the focus of the fund, but it’s not more sophisticated than that.”

(Respondent 7, Founder and partner of TVC)
Rather, it was put forward by a VC that limited partners find it attractive not to have a too strong focus area:

“I’m a board member of an investment bank that recently raised a technology fund that basically invests in everything: we are not limited by phases or what technology it is or anything, but only try to make the best investments. Limited partners find that attractive.”

(Respondent 5, Founder and partner of TVC)

On the other hand, it was indicated in the material that limited partners direct what types of companies that are not to be invested into:

“Limited partners direct what areas are off-limits. For example, 15 years ago, dating was strictly out of the question.”

(Respondent 7, Founder and partner of TVC)

However, there are indications in the empirics and in literature that the restrictions placed on funds can vary. Literature suggests that less restrictions are placed on funds established during years with great inflow of capital (Gompers and Lerner, 2004). In the material, it was put forward that the degree of influence a limited partner has depends on the track record of the fund:

“If you don’t have a track record, the limited partners may have a relatively big influence. However, once you have a track record, it is more of a level playing field. In our first fund, our limited partners had significant influence and were of the opinion that the fund shouldn’t invest in internet-related companies because they had burnt their fingers in the dot-com bubble.”

(Respondent 4, Founder and partner of TVC)

Lastly, a respondent noted that limited partners have a positive attitude to hyped areas, and that raising funds within these areas thus is easier:

“Machine learning is an example of a technology that is very hot at the moment - it’s on everybody’s lips. Instantly, it will be easier to raise money and get investors, because everyone has read that it is important.”

(Respondent 6, Founder and partner of TVC)

4.1.6 Digital companies aligned with risk aversion and need for large capital allocations

In the interviews, the venture capitalists described software companies and internet enabled commercial innovations as their main target market, and there was strong indications that presumable attractive returns was the rationale for targeting these companies:

“The market is awashed by lighter technology and commercial innovations. Investments in heavy technology are, however, not so common today. Instead, it’s has been very, very popular to invest in e-commerce during a time now.”

41
“Today, venture capitalists invest in software-based solution that are distributed over the internet.”

“Today, there are extremely valuable companies, such as Klarna, Spotify and King, that have managed to surf the wave of digitalisation. Investors now know that these types of companies are successful and thus seek to find the company that isn’t Spotify, but the next generation.”

“It also became apparent in the interviews that the government sponsored venture capitalist Industrifonden is also investing in above mentioned areas. However, as the the aim of Industrifonden is to catalyze the investments of the traditional venture capitalists, this is moderately surprising.

“We invest in the market that is relevant at the moment. Currently, the lion share of our investments are software companies, where we see a lot of potential market growth which is fitting the venture capital model. For example, if you compare the games development industry with the truck manufacturing industry in Sweden, it has over a very short period of time grown to be essentially comparable in size. So it’s quite natural that we invest more in software businesses where most of the deal flow and innovation are.”

That the target market for venture capital has shifted from capital-intensive sectors such as semi-conductors to emerging sectors such as the internet is also suggested by researchers (Mason, 2009; Gompers and Lerner, 2004). In line with what the respondents suggest, Gompers and Lerner (2004) contend that internet companies are currently being targeted as they offer opportunities to make successful exists and attractive returns as the interest from public investors currently is high. However, what is interesting to note is that the venture capitalists themselves did not express exit opportunities as having a significant influence on the investment decision.

The new target market is further described as having a very different cost structure than previous industries, due to the fact that companies are build upon digital infrastructure. According to Mason (2009), the internet sectors is characterized by lower start-up costs due to cheaper hardware, availability of open source software, and reduced advertising and distribution costs. Another characteristics is that digital firms grow profitable more quickly. As a consequence, the financing need of the companies is smaller and can be met by angel investors rather than venture capitalists in early stages. The companies that are still in the need of financing from VC will have made substantial progress in their development, thus being less risky investments, and have a smaller financing need compared to previous target markets (Mason, 2009).

2Respondent 10; Landström, Hans. Professor at Lund University. 2018. Skype interview 19/2
During the interviews, it was confirmed that the funding need in early stages is limited, due to the availability of cheaper hardware, knowledge and sales channels:

“Today, the barriers to building a software is extremely low. You can basically teach yourself how to build an app, how to publish it in app-store and have the entire world download it.”

(Respondent 2, Investment manager at GVC)

“Some time ago, buying the hardware required to start a software company was expensive. Today, it barely costs anything.”

(Respondent 5, Founder and partner of TVC)

These characteristics imply that little time and money is necessary in order to be able to launch the product on the market, test it and evaluate its potential:

“If you invest in for example e-commerce or software as a service, you quickly get metrics on whether or not you are making progress.”

(Respondent 1, Investment manager of GVC)

On the other hand, it was put forward in the interviews that a large amount of capital is needed to reach the market position necessary for attractive returns:

“Today, you invest in software-based solution that are distributed over the internet. There is of course costs for personnel, but first and foremostly, it is marketing and communication that costs. A great amount of capital is needed to be successful. You have to focus on growth, growth, growth - and growth is costly.”

(Respondent 8, Founder and partner of TVC)

“In Internet-related companies, the technology level is very low, but go-to-market is crucial. You have to spend a lot of money on marketing activities to be successful. And to invest in companies like that you need to see the potential for a global market, otherwise you will never succeed.”

(Respondent 7, Founder and partner of TVC)

“You have to become number one, because that actor takes an unproportional share of the markets total value. Therefore, it is rational to invest as much as you can because if you succeed in becoming number 1, your return will be disproportionate in comparison with number 2. Not to speak about number 3 to 5 - they won’t be worth anything.”

(Respondent 2, Former investment manager of GVC)

4.1.7 Conclusions regarding the VCs’ preferences

To summarize, this study indicates that VCs have the following preferences:

– VCs seek financial return

– VCs are risk averse
– VCs invest where they can allocate large amounts of capital at once
– VCs invest broadly but in areas in which they are knowledgeable
– VCs invest in promising teams

Below follows a brief description of each preference and the current target market of the VCs.

To begin with, the empirical material concludes that financial return is a strong driver of venture capitalists’ behavior. From literature, one understands that attractive financial return is a prerequisite for TVCs to be able to raise new funds. When it comes to GVCs, the empirical material indicates that financial returns is essential for maintaining the capital base. According to literature, the aim for financial return make VCs invest in areas that are in the public lime-light. While some respondents confirmed that the exit market is taken in consideration when investing, others suggested that it was not an important factor during the investment decision.

Over the last years, Swedish VCs seem to have transitioned to focus on later stage investments, which seems to be driven by two separate preferences: the preference of allocating large sums at once and the preference for investing when risk is low. The preferences of allocating large sums at once is indicated to be a consequence of the fact that the fund sizes have increased. Evidence of the existence of these preferences is not only found in our empirical material but is also supported by existing research. The preference of later stage investments was further supported by the respondents’ strong emphasis on the existence of a proof of concept and the ability to evaluate the potential. However, as indicated in the material, investing in early-stage is considered necessary to gain access to the most promising deals.

Further, the material indicated that most actors within the field invest across industries. However, the material does not reveal whether or not a diversification strategy is intentionally pursued. What was put forward by an investor was that having a too explicit specialization or diversification strategy may be disadvantageous, as one may miss out on attractive deals. The study also revealed that the investment focus of the VCs may be affected by the knowledge and interest of the VCs. That investors are more inclined to invest in domains where they have knowledge is supported by literature.

The empirical material showed that VCs believe that the team is a deciding factor and that great emphasis is placed on the team when investing. What literature suggests is that the qualities that VC look for are leadership, track record and familiarity with the target market. These explicit qualities were not specifically mentioned by the respondents. Rather, the empirical material indicated that the assessment of the team may be subjective and that the personality of the entrepreneur has to match the personality of the investor. While some literature reject this notion, other argue for the fact that the investment decision is affected by similarity bias.

What the interviews also revealed was that VCs’ investments do not seem to be significantly influenced by limited partners. What was put forward was that limited partners generally have limited preferences regarding the focus of the fund, but may
dictate what investments the VC fund is not allowed to make. The material indicates that this is especially true if the fund has limited track record.

The interviews revealed that the VCs today are focusing on digital companies that are software-based and internet-enabled as these offer attractive financial returns. The current target market and rational for investing is confirmed by literature. In line with research, the respondents described the digital companies as having limited start-up costs. However, the respondents added that a characteristic of the companies is that great amounts of capital is necessary to grow the companies to a size where returns are attractive. Further, the respondents contended that limited resources is needed to test the market acceptance. The conclusion that one can draw from this is that the digital companies are in line with the VCs’ preferences for financial return and to invest large amounts of capital at later stages.
4.2 Investments in new technology

The purpose of this section is to give an understanding of what characteristics new technology firms have and what challenges Swedish TVCs and GVCs face when investing into new technology. This section thus gives an answer to the second sub-research question. The insights presented in this section were gained by first asking the respondents about the characteristics and challenges with NTBFs and then comparing them with the preferences of VCs found in the previous chapter. Throughout the section, references are thus made to the findings in section 4.1. Before the challenges are presented (section 4.2.2-4.2.9), the respondents personal constructs and perceptions of new technology are presented (see 4.2.1). Moreover, it is described how new technology investing affects the preferences of VCs in 4.2.10.

4.2.1 The investors’ definitions of new technology

During the interviews, it was apparent that the associations VCs had with the concept of new technology varied. When giving descriptions of what could be considered as new technology, most respondents focused on the relationship between the technology and the market it was introduced on, rather than describing the characteristics of the technology itself. As an example, one respondent suggested that new technology creates products and services that are significantly different and in stark contrast to what has existed before. A comparison can be made to the concept of discontinuous innovation, that are described to signal a break from established products (Tushman and Anderson, 1986), and to radical innovation (see 3.1.1).

“Two examples of new technology from our portfolio is Tobii and MIPS. In those cases, significant leaps in technology were made. It’s not something incrementally better. It’s radically different and a leap from what has existed before.”

(Respondent 2, Former investment manager of GVC)

Further, a respondent added that new technology can imply a technological advancement that is introduced on an already established market, thus having similarities with the concept of technological innovation as described by Sood and Tellis (2005) and Arthur (2007):

“New technology can be a lot of things. It can of course be something that hasn’t at all existed before. However, it often is a technology advancement on an established market, meaning that a new technology replaced an old.”

(Respondent 5, Founder and partner of TVC)

In line with the definition of new technology by Adner and Levinthal (2002), there were also indications in the empirical material that investors considered investments to be new technology if already existing technology were used in a new way.

“Is it new technology for a certain market? Then I would call it new technology. The technology itself might not be new but the application of it is.”
In contrast to the above described interpretation, literature define that the technology risk for NTBFs is significant (Cooper and Bruno, 1977; Arthur, 2007). By this definition, investments in already existing technology would not be considered as new technology. Further, the definition implies that investments can only be considered to be new technology investments if they involve the early stages of technology development, which was also suggested by a respondent:

“When investing in a company with revenue, the degree of technology innovation is significantly lower due to the fact that the technology risk more or less is gone. Then it’s more about finding and improving an application for the customer. As I see it, that’s not new technology.”

(Respondent 8, Founder and partner of TVC)

Lindstrom and Olofsson (2001) contend that new technology firms often originate from university or other research related environments, a notion that the respondents agree with:

“New technology is rarely developed in a basement workshop in for example, Östersund or Transás. It comes almost exclusively from the labs of the large corporations or the universities.”

(Respondent 3, Former investment manager GVC)

“The companies typically come from universities or other institutions where research is conducted. Very few new technology companies are non research-based.”

(Respondent 2, Former investment manager GVC)

What also came forward, was that some respondents considered high technology and new technology to be interchangeable:

“High tech... New tech... High tech... To me, they have the same definition.”

(Respondent 7, Founder and partner of TVC)

Interestingly, several respondents stressed that new technology is sometimes used to refer to the commercialization of non-recent inventions. This is not very surprising considering the original definition of innovation as the commercialization process of an invention (Schumpeter, 1961) and that there is a significant time lag before the innovation of the invention start (Fagerberg et al., 2005). However, respondents put forward that this is not what they mean with new technology:

“To me, new technology is an invention. Today, the concept new technology is however used to describe something that is in the process of being commercialized or that is becoming ready to use. What people call new technology is really old technologies. AI is for example something we were taught at the university. And digitization is something that started in the ’50s. It’s nothing new.”

(Respondent 6, Founder and partner of TVC)
“If you deep dive into technologies and technological leaps, you will realize that we talked about the technologies of today 40 years ago. It takes time before it flourishes. A number of enablers are necessary.”

(Respondent 8, Founder and partner of TVC)

Another term that a number of respondents mentioned during the interviews was the term deep tech. As described in 3.1, the term deep tech has not yet received attention in literature. Some definitions given by consultancies and other industry actors are that it is companies with strong research bases, that are centered around scientific advances (de la Tour et al., 2017) and that they have the potential to catalyze change (TechWork, 2018). What came forward in the interview, was that many equate deep technology with AI:

“The last year or so, there has been much talk about deep tech. It’s a new term that hasn’t been spoken of earlier. To many, deep tech is the same thing as AI. So it’s not what people earlier thought is was - some kind of new circuit board technology. It’s still within software but close to research.”

(Respondent 2, Former investment manager GVC)

In accordance with the opinions put forward regarding commercialization of non-recent inventions, an investor put forward that deep technology isn’t new technology. What the investor rather suggested was that the technology behind deep tech and artificial intelligence has existed for many years and that the term rather is used by funds that need to differentiate themselves when raising capital:

“Deep tech and AI are often used by venture capitalists, media and entrepreneurs in attempts to brand themselves. But what is AI? It’s nothing that has suddenly emerged - it’s a consequence of Moore’s law. Deep tech is not a wave of new technology.”

(Respondent 4, Founder and partner of TVC)

However, important to note is that the term deep tech was very ambiguously used during the interviews. Some respondents did not seem to equate deep tech investments with AI, but rather used it as a synonym for new technology. This should be kept in mind when reading the responses from the interviewees.

Conclusively, what is essential to understand from the empirical material above is that the usage of the term new technology, as literature suggests, is ambiguous and that is used both to refer to a technological advancement on an already existing market, finding a new application to an already proven technology and to technological advances that create new markets. Further, there seems to be ambiguity regarding whether or not commercialization of non-recent inventions are to be considered new technology. An alternative interpretation of new technology investments is investments that hold a significant degree of technology risk.
4.2.2 Investors’ attitude towards new technology

When researching the importance of different investment criteria of venture capital firms, Macmillan et al. (1985) concluded that venture capitalists generally do not regard it important that the product is high-tech.

In line with this research, the interviews revealed that the investors did not perceive the technology itself, regardless of the newness of the technology, to be a value driver and thus an important factor during the investment decision:

“We don’t think about technology in itself. We even think it’s a bad strategy to invest in technology. On the other hand, it’s a good strategy to invest in revolutionizing business models, great products and teams, and large markets. Technical innovations are overrated.”

(Respondent 4, Founder and partner of TVC)

“Often, it is believed that the technology is some kind of Messias. That’s not the case though; the technology is irrelevant if you don’t have a great leadership”.

(Respondent 7, Founder and partner of TVC)

“If it’s not commercially viable, it doesn’t matter how good the technology is. It’s the market that breaks the case. Technology is something you can always solve.”

(Respondent 5, Founder and partner of TVC)

“No one invests simply because it is new technology.”

(Respondent 3, Former investment manager at GVC)

“I remember research that I saw a couple of years ago, where they investigated 8-10 things that VC firms look at when investing. Unique technology was one of them. They compared the factors and saw that large amounts of money was invested into new technology, but when looking at where value was created, it was one of the factors that was the least relevant.”

(Respondent 4, Founder and partner of TVC)

The same respondent however added that the value of new technology isn’t constant over time, but increases during technological revolutions (please see 3.1.1 for an introduction to the concepts of long waves and technological revolutions):

“According to the so called Kondratieff wave theory, approximately every 50 years, innovations and disruptions that change the entire society occur. During those times, unique technology is important. At a certain point of time, there will come a new wave where unique technology is important again. Internet in itself is probably the latest so called wave.”

(Respondent 4, Founder and partner of TVC)

To further illustrate this notion, the respondent suggested that none of the most valuable companies of today are based on new technology:
“If you look at the last 10 years in the Nordics. Where has the value been created? It’s in 8-10 companies. It’s in Skype, Supercell, King, Klarna, Spotify, iZettle and a few others. Are any of these companies based on innovative technology?”

(Respondent 4, Founder and partner of TVC)

However, some respondents acknowledged that new technology has its advantages, suggesting that such companies are difficult to replicate and thus can reach a dominant market position:

“When based on deep or high-tech, you can reach a valuable position where no one can get you because you have both patents and know-how.”

(Respondent 2, Former investment manager at GVC)

“What is interesting with new technology is that it is easier to protect. Since new technology cannot be easily copied, you can achieve monopoly on a part of a market.”

(Respondent 1, Investment manager at GVC)

4.2.3 How investor preferences differ

A topic that was necessary to dive into during the course of the study was whether or not venture capital firms have different preferences when investing in new technology-based firms. While the interviews gave no indication of either, literature on the topic indicates that there are no differences in preferences. For example, Lockett et al. (2002) contend that investors still put significant emphasis on the quality of the management when evaluating new technology-based firms, but does not indicate that it would be a more important investment criteria. Furthermore, (Guild and Baccher, 1996) also argue that the characteristics of the entrepreneur is a more important criteria than the characteristics of the market and the characteristics of the venture offering when investing in new technology, which is in line with research that does not specifically look at new technology-based firms (Macmillan et al., 1985). In line with the found risk aversion (see 4.1.2), Wright et al. (2006) suggest that investors, when investing in new technology, are more inclined to invest in start-up stage rather than seed-stage, where proof-of-concept still occurs.

4.2.4 VCs perceive the teams as lacking

In literature, the teams of new technology teams are widely regarded as lacking commercial experience and managerial skills (Sjögren, 2001; Landström, 2017; Lockett et al., 2002).

During the interviews, it became apparent that the VCs, in line with what literature suggests, perceive the teams of NTBFs to be lacking competences that are relevant when commercializing the technology:
“The team of a new technology-based firm is small and good at technology development, but the other components are not in place. That’s the main challenge.”

(Respondent 8, Founder and partner of TVC)

“Tech-entrepreneurs that want to realize new technology aren’t interested in business building.”

(Respondent 7, Founder and partner of TVC)

“It’s always a challenge to have a team from academia. They have seldom found a product-market fit - and they seldom have the competences and team that can take them there. Regardless where the team comes from they have to be able to attract talent that is required to grow the company and unfortunately talent has been diluted among the many startups today.”

(Respondent 1, Investment manager at GVC)

One respondent however suggested that there is a positive trend and that many new technology entrepreneurs are becoming more market oriented:

“There is a huge difference. New technology entrepreneurs are much more market-oriented today than before.”

(Respondent 7, Founder and partner of TVC)

When contrasting the described characteristics of the teams of NTBFs with the VC’s strong emphasis on the team, it becomes apparent that there is a mismatch. This mismatch may discourage VCs from investing. This notion also finds support in literature by Wright et al. (2006) which claim that NTBFs are often rejected due to the lacking skill of the entrepreneur. Furthermore, literature suggests that the teams of new technology based firms pose a particular barriers since they seldom have a track record that can be considered (Lockett et al., 2002). However, that this is a barrier was not indicated by the empirical material.

In addition, literature suggests that new technology investors, as a consequence of the flaws in the team, need to be involved in helping the entrepreneurs to build the company (Lockett et al., 2002). Interestingly, there were indications in the empirical material that this poses a barrier to investing for the venture capitalists, as these are not interested in business building:

“It’s not the job of the VC to build the company. The entrepreneurs are to approach us because they want to do something and have a plan for how to do it. We shouldn’t be the ones that are operative - we are not the entrepreneurs. If that’s not in place, we will look at another company that has succeeded in these aspects.”

(Respondent 1, Investment manager at GVC)

An explanation to the lack of interest in business building may be that VCs perceive it to be a better use of resources to scout for new investments rather than improve current businesses.
An interesting note is that there seems to be a general consensus among researchers about the fact that the teams of NTBFs are lacking. However, it seems that these conclusions rest on the perceptions of VCs and other investors. Whether or not the teams truly are lacking has not been established by research.

Further, what is important to keep in mind is that the interviews indicated that the personality of the entrepreneur needs to fit the personality of the investor (see 4.1.4). An alternative explanation to the VCs’ negative impression of the NTBF teams may thus be that there is a mismatch in personalities, of which there were indications in the interviews:

"I would not invest only in technocrats even if they had the best invention in the world, because it’s impossible to deal with such people."

(Respondent 7, Founder and partner of TVC)

4.2.5 Investments associated with compounded risk

During the interviews, it became apparent that the investors perceived investments in new technology to be associated with great risks. As one respondent put it:

“The risk of default is very large in companies based on a unproven technology.”

(Respondent 8, Founder and partner of TVC)

Literature in the field confirm that the investments are considered to be synonymous with high risk and give several explanations why. For example, literature contends that the risk is high as the technological, market and managerial risk is compounded (Landström, 2017; Murray, 1999). The technological risk is argued to be high as the assessment of the technological feasibility is problematic (Landström, 2017; Wright et al., 2006). Furthermore, the marketability is suggested to be difficult to assess (Wright et al., 2006; Lockett et al., 2002) as new technology often creates new markets (Lindstrom and Olofsson, 2001; Lockett et al., 2002). In these cases, there is limited understanding of the customer demand (Lindstrom and Olofsson, 2001; Dimov et al., 2012), why assessing the potential can be more problematic (Lockett et al., 2002). However, assessing the potential can also be difficult when introducing the product or service to an existing market (Sjögren and Zackrisson, 2005; Landström, 2017; Murray, 1999). Literature also adds that it can be difficult to identify a market in which to apply the technology in the first place (Wright et al., 2006) and to comprehend the product or service (Landström, 2017). The high degree of uncertainty is also suggested to be related to the fact that the nascent industries are novel to the VC firms. This renders that the viability of its opportunities is difficult to understand and assess (Dimov et al., 2012). Further, new technology poses specific challenges in evaluation as there are no benchmarks or track records that enable comparison (Lockett et al., 2002; Dimov et al., 2012).

During the interviews, the respondents suggested that uncertainty is high as it seldom is known what market is being targeted and as evaluating the potential is difficult:
“The greatest challenge with new technology is that you are not entirely sure what value you will be offering the customer.”

(Respondent 2, Former investment manager at GVC)

“When investing in the very early stages of new technology, you invest in ideas and people. You try to assess the technology and the commercial aspects. It is always the commercial aspects that will be deciding - but assessing them can be very difficult.”

(Respondent 8, Founder and partner of TVC)

It was added, that these characteristics create a barrier to investing as it is misaligned with the investors risk aversion:

“Before investing, one needs to have a notion of the financial plan and what is required to bring the product or service to the market - and that’s a challenge in the case of new technology-based firms. You invest in a black hole. And that’s not something you like as an investor. You want to know what is necessary to take the product to market and onwards.”

(Respondent 1, Investment manager at GVC)

In addition to being misaligned with the risk aversion, the riskiness of the investments may pose barriers in other ways. As described in 3.3, VCs stage investments when facing high risk, which results in high monitoring costs (Gompers and Lerner, 2004). If Swedish investors behave as literature suggests, risky investments such as NTBFs will require more resources from the investors. Given that investments are evaluated on their return on investment, it is likely that this poses a barrier to investing.

4.2.6 VCs lack critical knowledge and experience

As put forward in section 4.2.5, research suggests that NTBFs are associated with uncertainty as the investments are novel to many VC firms (Dimov et al., 2012). Similarly, one respondent suggested that many Swedish VCs are generalists and that these lack specific knowledge and experience that can be critical when evaluating new technology. The respondent added that the investors rather undertake investments that are easy to understand:

“Specialists that invest in narrow industry domains and have been in the industry for a while have an entirely different possibility to assess the risks of new technology themselves than generalists. But many Swedish VC firms are generalists, meaning that they invest in a broad range of industries. As a consequence, they invest in companies that are easy to understand, such as internet-related or social media companies, rather than deep technology companies.”

(Respondent 3, Former investment manager at GVC)

That new technology investments require specific competences was also indicated by another respondent. The respondent however added that VCs when lacking this
competence in-house take advice from experts:

“The competence necessary to be able to evaluate companies with new technology is very different. It’s much harder. But you try your best and get assistance by experts.”

(Respondent 8, Founder and partner of TVC)

That VCs, when lacking the competence or knowledge in-house, seek to establish relationships with experts to gain new sources of information, is supported by Dimov et al. (2012). Thus, how important it is to have the specific competence in-house to be inclined to invest seems to be debatable.

In accordance with the first quote, Lockett et al. (2002) conclude that generalists face greater valuation difficulties than specialists when investing in new technology. The suggested reason thereof is because they use traditional financial based valuation methods, while the firms are based on intangible intellectual property rights (Lockett et al., 2002). As described earlier, other researchers argue that investors that have previously made exploratory investments have greater insights regarding the uncertainty and dynamics of nascent domains. Such investors are more inclined to invest in early stage, unfamiliar companies and industries (Dimov et al., 2012). If specialists have a focus on nascent domains that share characteristics with new technology-based firms then it is likely that they are more inclined to invest into NTBFs.

To conclude, insights drawn from the empirical material and the literature is that investors that lack specific experience and knowledge will be discouraged from investing in new technology-based firms. Given that the VCs are currently aligned towards investing in digital companies, it is difficult to imagine that the VC investors of today would possess the necessary experience, knowledge and network to invest into NTBFs

4.2.7 Finding co-investors is perceived difficult

Lockett et al. (2002) suggest that generalist VC firms to a greater extent will syndicate deals with other VCs, due to the greater risks and uncertainties with NTBFs. As Gompers and Lerner (2004) suggest, a reason to syndicate is to have have other investors approve the deal and thus limit the risk of funding a bad deal. This is of special importance when investing in early stage or technology-based firms. In later stages, the venture capitalists are not as likely to question their judgment (Gompers and Lerner, 2004). Lockett et al. (2002) adds that it is syndication with a specialist VC firms that helps reduce the risk of funding a bad deal, due to the fact that specialists VC firms have the skills to make superior selections of investments (Lockett et al., 2002).

During the interview, the respondents put forward that syndication is of particular importance when investing in new technology-based firms, but state that the reason is because the venture capitalists want to increase the amount of available
capital to meet the unforeseeable capital needs that often arise when investing in new technology-based firms:

“I believe that one often prefers to syndicate when investing in new technology-based firms because one fears that the capital need will be much higher than first anticipated. You want to have the financial muscles.”

(Respondent 2, Former investment manager at GVC)

“I believe that it is even more important to syndicate when facing technology risk than when facing market risk. The reason why is because you know that things will take longer time than anticipated. As a consequence, you need a stronger syndicate that has the ability to support the company for an additional year or two if necessary. If you only have market risk, there is a clearer indication on where you are going. It’s easier to assess whether or not it will be possible to bring in more capital.”

(Respondent 1, Investment manager at GVC)

However, the opinion of several respondents was that there are difficulties in finding co-investors that are willing to invest and have sufficient amount of capital:

“When we refrained from investing in new technology, it was because components in the team were missing or because we didn’t have co-investors that were strong enough.”

(Respondent 2, Former investment manager at GVC)

“It’s often challenging to pool the necessary capital. Unfortunately, few are interested in investing in these early-stage capital intensive companies. There is so much else on the market that is easier to invest in where you can get a return or call the bets faster.”

(Respondent 1, Investment manager at GVC)

However, one needs to be cautious to draw the conclusion that the responses above indicate that the number of interested investors is small. An alternative explanation could be that the co-investors in the networks of these specific respondents aren’t interested in investing. As the current target market for VC investors is digital companies, it may be so that the network of the investors mirrors this preference. An implication could be that the cost for finding co-investors is unreasonably high.

4.2.8 Funding need and time to market is substantial

Literature suggests that the attractiveness of NTBFs is low as the time until a substantial return is long (Wright et al., 2006) and since new technology-based firm often face a much longer period of negative cash flows than other firms (Murray, 1999; Lindstrom and Olofsson, 2001). The time to break-even has been found to be related both to the degree of technological novelty and market novelty (Lindstrom and Olofsson, 2001). The perception that new technology has a significant funding need and a long time to market was strongly supported in the material:
“To take the step from having a new technology to a commercially viable business model is very large. It takes a very long time and will cost money - and traditional VCs that have a close-end fund can’t sit and wait for 7 years while a company is figuring out their business model.”

(Respondent 2, Former investment manager at GVC)

“When investing in early-stages, there is always a lot left to do - and time is always your enemy. The longer it takes, the smaller the likelihood that that the investment is successful.”

(Respondent 8, Founder and partner of TVC)

As the quote indicates, the time aspects not only poses challenges as it affects the rate of return, but also because the structure of the VC does not allow long investments. As described in 3.2.2, funds often have a limited life time of 6-10 years.

Further, literature suggests that a long time to market poses a risk as the technological landscape is rapidly changing, shortening the life of the products (Sjögren, 2001) (Landström, 2017) (Murray, 1999). A respondent described the same notion as follows:

“Time to market is crucial today. I would never enter new technology today, if I had to invest money into building patents on numerous continents for a number of years. During that time, the technology will be replaced by others.”

(Respondent 7, Founder and partner of TVC)

What the respondents also put forward was that new technology-based firms are perceived to be associated with a large funding need:

“Deep tech companies require 100 to 200 million. Maybe even a billion just to overcome the technology risk and then you still have the market risk.”

(Respondent 1, Investment manager at GVC)

“In contrast to software companies, you need capital both for development and hardware. Additionally, you have risks associated with establishing a production and making investments necessary for reaching the market.”

(Respondent 8, Founder and partner of TVC)

An interesting note is that research suggests that large funding need of new technology poses particular challenges to small funds (Murray, 1999). Firstly, the small fund size implies that the fund can only make a limited number of investments. This implies limited opportunities to diversify and to spread risks. Secondly, due to their size small funds, when investing in cash consuming new technology-based companies, need to syndicate with larger funds in subsequent rounds. Most likely the smaller fund will then see its investment being diluted as it is forced to accept a low equity revaluation. As a consequence, the small funds have difficulties in receiving adequate compensation for the risk they face, and will thus be dis-encouraged to invest (Murray, 1999). A respondent also expressed concern regarding small funds ability to invest in new technology:
“A small seed-fund could never finance new technology development. They don’t have the financial muscles. It would never work. And they don’t have the long time perspective, since there is a cap on how much they can invest. And deep tech requires 100 to 200 million. Maybe even a billion.”

(Respondent 1, Investment manager at GVC)

4.2.9 Conclusions regarding new technology investments

To summarize, both literature and the results of this study indicate that the usage of the term new technology is ambiguous and can refer both to the development of a new technology, the introduction of existing technology onto a new market, or the introduction of a new technology onto an already existing market. A consequence thereof, is that new technology investments hold a varying degree of technological risk. However, it is understood from the discussions that it in this context is relevant to interpret new technology as early-stage investment in new technology-based firms that still face high technology risk. As research suggests, the investors were found to be indifferent to the technology aspects of the investments, not perceiving the technology, regardless of novelty, to be a value driver and important factor during the investment decision. However, there were indications in this study, that the investors interest in new technology changes over time and is likely to increase in times of a technological revolution. Respondents also acknowledged that new technology can enable firms to reach a valuable market position as firms based on new technology are easier to protect and thus difficult to imitate.

Literature contends that investment preferences do not change when investing in new technology, arguing that emphasis still is placed on the team and that investors are still reluctant to invest in the early-stages. The current study gave no indications of either option.

Below is a description of the challenges that the respondents put forward in the interviews and a description of how these relate to the preferences of the investors.
**Challenge Description**

**Lacking teams**

This study gives strong indications that VCs perceive the teams of new technology-based firms to be lacking. More specifically, what was emphasized during the interviews was that the teams of new technology-based firms lack interest and competence necessary to commercialize the technology. That the teams are perceived to be lacking is strongly supported by literature. Yet, it is important to note that it does not seem as research has attended to whether or not the teams truly are lacking. What the respondents and literature contend is that VCs due to the lacks in the team need to engage in business building, something the interviews indicate that VCs are not interested in. Further, literature suggests that the lacking teams are mismatched with VCs strong emphasis on the team.

**Compounded risk**

The interviews revealed that investments in new technology are perceived to be associated with high risks. The respondents suggested that the high risk is related to the uncertainty regarding the target market, the cost and time to reach the market, and the marketability and technological viability. All aforementioned aspects are supported in literature. What the respondents also added, and what can be understood from comparing these findings with the preferences of the VCs, was that the risk profile is ill-matched with the investors' risk aversion.

**Difficulties to syndicate**

The respondents and literature indicate that syndicating is more critical when investing in new technology, as this reduces the risks associated with new technology-firms. However, according to the respondents, few are willing or have the sufficient capital to invest in new technology. However, one should be cautious to draw the conclusion that this means that there is a scarcity of interested investors. It may be so, that the network of the specific respondents aren’t interested in investing and that the cost for finding a co-investor thus is unreasonably high.
Specific knowledge required

Both literature and this study indicate that investors that lack specific knowledge or experience in new technology investing will face specific challenges when assessing new technology. However, to what extent investors lack these specific knowledge and experience and to what extent in-house skills are required remains unclear. Given that the VCs currently are targeting digital companies, it is difficult to imagine that the industry possesses the experience, knowledge and networks that enables investing into NTBFs.

Long time to market

This study finds that VCs perceive the time to market for new technology firms to be longer compared to other investments. That new technology firms have longer time to market is supported by literature. What the interviews indicate is that the long time to market negatively affect the rate of return, which implies that the potential of the investment needs to be significant to be attractive for venture capitalists. Literature and the respondents also suggest that the long time to market increases the riskiness of the investment as substitutes may emerge. In light of the VCs risk aversion, one understands that these characteristics poses a barrier to investing. Further, as literature proposes that TVCs have a short time limit on their funds, one understand that that TVCs face specific challenges for investing.

Large early funding need

The interviews also revealed that the VCs perceive new technology to be cash-consuming in early stages, which one can understand is misaligned with the VCs risk aversion. Further, what both the interviews and literature emphasized, was that the significant funding need poses particular challenges for small funds. As literature suggests, this is due to the fact that they only can invest limited amount of capital and because their investments are diluted as new investors enter the firm.
4.3 A synthesis: The role of Swedish VC

This section gives an answer to the main research question through synthesizing the findings from the two previous sections.

4.3.1 The relative attractiveness of NTBFs

Section 4.2 reveals several challenges with NTBFs. These findings have been reached both through asking respondents about the challenges with NTBFs and through comparing the preferences with the found characteristics of NTBFs. However, the challenges presented in section 4.2 do not alone provide a comprehensive picture of VCs and their relation to new technology based firms. By further analyzing the preferences put forward in section 4.1 and relating these to investments in new technology-based firms, further insights into what roles GVCs and TVCs play in the funding landscape of new technology can be achieved.

What becomes evident when contrasting the current target market of the VCs with NTBFs is that the availability of a better alternative also poses a barrier for investing into NTBFs. The digital companies are considered to be able to create attractive value. This stands in contrast to the perceptions of new technology that aren’t seen as especially valuable (see 4.2.2). Considering that VCs are strongly driven by financial return, it is unlikely that venture capitalists will show great interest in these types of investments. Further, digital companies are much better aligned with VCs risk aversion and preference for investing large amounts of capital at once. Based on the relative attractiveness and the challenges, it is considered unlikely that the Swedish VCs are significant investors into new technology based firms.

4.3.2 Are TVCs and GVCs equally disinclined to investing?

As described in 4.1.1, research suggests that GVCs should be more inclined to invest into new technology than traditional venture capital as they can have a slightly different incentive structure and not only be driven by financial goals. This study reveals that Industrifondens preferences and behaviors are very similar to those of traditional venture capitalists. On the other hand, Almi Invest seems to have a focus on early stage and business building, from which the conclusion can be drawn that they should be more inclined to invest in new technology. However, as Almi Invest is limited to only investing 10 MSEK into a single company, Almi Invest have similarities with small funds. As put forward both in the interviews and in the literature, small funds face particular barriers to investing in new technology. For example, literature suggests that they do not receive adequate compensation for the risk they have taken as their investments become diluted in subsequent financing rounds. So despite a significant access to capital, the structure of Almi Invest most likely negatively impacts the ability to fund NTBFs. As a consequence, traditional venture capitalists and government-supported VCs both seem to face extensive barriers to investing in new technology-based firms.
In conclusion, this study found that there are extensive mismatches between investor preferences and new technology investing, both for TVCs and GVCs. Currently, there is also a better aligned alternative. Based on these findings, it is considered unlikely that the Swedish TVCs or GVCs are significant investors into new technology based firms.

**Figure 6:** In contrast to digital companies, NTBFs are found to be ill-matched with VCs preferences.
5 Discussion

The purpose of this chapter is to provide nuance to our findings and briefly examine the wider context in funding of NTBFs. The discussions are anticipated to provide further understanding of what implications on innovation our findings may have. The discussions depart from insights that were gained during the process of writing the study. The outline of the section is described below.

First, in 5.1 it is discussed whether there is a lack of capital for NTBFs given current market conditions. Differing opinions from our respondents and academia are weighted against each other. It is concluded that an abundance of capital exists but it is not necessarily allocated to NTBFs. Consequently, whether VC will allocate capital to NTBFs in the future is discussed in 5.2. In 5.2.1 potential policy changes to incentivize VCs are reviewed.

From section 5.3 and forward an attempt to put funding of NTBFs into a wider context is made. This has been done to capture interesting aspects provided by the respondents during the interviews. Note that this content is not part of the findings nor within the purpose of this thesis, but rather provide a baseline for further thought and additional research. Section 5.3 discusses whether other investors can provide capital to NTBFs. Business angels, family offices, business networks, CVCs, university funds, IP-funds and crowdfunding are briefly discussed. A short discussion regarding the demand side of NTBFs follows in 5.4 after which both demand and supply aspects is conceptualized in the notion of ’thin markets’ in 5.5. The chapter concludes in 5.5.1 with a discussion on ’thin markets’ and its implication on technology development.

5.1 Supply of VC capital to nascent firms

This section first highlight opinions of our respondents which claim that there is no lack of funding for NTBFs. These opinions are contrasted against academia which claim that a funding gap exists. The section concludes that there is an abundance of capital on the market but its likely allocated elsewhere than NTBFs.

Although the respondents recognized that most VCs are not likely to invest into new technology based firms, many noted the huge amount of VC capital available for young firms today and argued that it is unlikely that there currently is a lack of capital for new technology based investments based on this. This reflects the data from Atomico (2017) suggesting that 2017 was a record year in terms of capital raised by nascent firms.

“At the time being, it is difficult to argue for the fact that there is a funding gap anywhere, since there is an enormous amount of money that is seeking return.”

(Respondent 2, Former investment manager at GVC)

“There is so much capital in the market today. It would be very strange if you had a reasonable, sensible idea and didn’t get funding.”
Regarding the supply for NTBFs it is clear that the view that there is no funding gap today for any type of firm stands in stark contrast against a large body of literature provided by academia. Previous research indicate that there is a significant funding gap for early stage firms and NTBFs in particular (e.g. see Dimov and Murray (2008); Hall and Lerner (2010); Veugelers (2011); Mina et al. (2013); Kochenkova et al. (2016)). What can possibly explain the difference between the research and the view presented by our respondents? Potentially, the difference could be temporal; the conclusion regarding the funding gap could be depending on timing of the research. In other words, most reviewed research claiming a funding gap have analyzed data from the last decade and the early part of this decade. During this time both the dot-com crash and the financial crisis impacted the overall supply to the venture capital industry. These conclusions then become artifacts that are used in subsequent research (e.g. Munari et al. (2018)) without checking the contemporary situation. Conversely, today the economy is booming and the difference could simply be that the respondents have a direct view of the current situation. However, one must be cautious in accepting this explanation without questioning it. The notion that there is no funding gap assumes that a surplus of capital implies that more investments are being made, across all types of investments. This is not necessarily the case. It could simply be that the valuation of firms have increased. Studying the data provided by Atomico (2017) this seems to be a probable explanation. The median deal size have increased from $3.3 million in 2012 to $5.5 million in 2017. In addition, while the number of deals have increased, it could simply be that investments are made into certain ideas and not others. Indeed, what is viewed as a "reasonable, sensible" idea and not implies that ideas that are misaligned with the investors’ preferences, such as early-stage investments, does not receive funding:

“As I see it, there is currently a great amount of money, that is seeking a limited number of good investments. Even though the amount of capital is large, that capital might however be predestined for later stages.”

This notion is further supported by the report by Atomico (2017), that notes that the number of seed deals have further declined in recent years, suggesting a shift away from the early stage. This is in line with the results in 4.1.2.

Given that investments in NTBFs entails investing into early stages, the conclusion drawn from these different perspectives is that a surplus of capital does not necessarily have to imply that there is no funding gap for new technology-based firms. There still seems to be preferences that affect the selection which is in line with the results presented in the previous chapter.
5.2 A future VC shift?

This section discusses exogenous events which might cause the Swedish VC firms to shift their investment focus. First, in 5.2.1, a change in the risk return profile of digital companies is discussed. Second, a technological revolution is presented as a plausible event causing a shift. Thirdly, a change in the relative attractiveness of NTBFs is considered. Subsection 5.2.2 discusses direct interventions that can be undertaken to either change or incentivize the industry to move towards more investments into NTBFs.

5.2.1 Exogenous events a potential source of a VC shift

Considering our findings in the empirical material and the conclusion in the section above it seems unlikely that Swedish VC firms themselves will change their preferences, make a shift and start investing into NTBFs. Consequently, if a shift occurs it must be caused by an exogenous event which incentivizes the industry to move away from its current preferences.

Based on research, data (Isaksson, 2006; Atomico, 2017) and our findings it is evident that the industry has become increasingly risk adverse since the dot-com crash in 2001 and continues to be so despite the current macroeconomic boom. Unless VC becomes more prepared to take on risk, especially related to technology, there will not be a shift towards new technology investments in the future. Furthermore, current returns related to digital firms have been high, especially in Sweden considering the success stories of Spotify, Klarna and iZettle. Currently, there is simply no incentive for the VC firms to move from their present sweet-spot. This scenario is likely true for both TVCs and GVCs given the similarities between them identified in our research (disregarding Almi which faces other challenges as discussed in 4.3). However, there are evidence that suggest that there are some initial signs of diminishing returns from digital investments (Andrews et al., 2008). In addition, it is important to note that that digital companies still is associated with significant financial risk due to the large amount of capital needed to become world leader. Hence, if the returns eventually stoop too low it could prompt VC firms to shift due to an unfavorable risk return ratio, instead looking for investments with a higher return profile. Whether or not NTBFs have a higher return profile has not been established but given the protectability of their technology its easy to envision that at least certain NTBFs will have superior return potential.

A VC shift could also be caused by other exogenous events, such as the advent of a new technological revolution akin to the introduction of the internet. This would likely cause a shift for all investors, not just VCs, as they race to invest into firms attempting to exploit this revolution, exactly like they did during the internet boom during the 1990s. Such a revolution would likely be tumultuous for the VC industry as the industry today is built around competences and networks that facilitate investments in software companies.

A change in the attractiveness or quality of NTBFs seeking funding could be the
third event causing a (small) VC shift. As established in our empirical material, the VCs believe that the team is a deciding factor and that great emphasis should be placed on the team when investing. Furthermore, VCs believe that teams behind NTBFs lack managerial skills. This forces VCs to engage in business building, which they are not interested in (see 4.2.4). However, as indicated by one of our respondents, there seems to be a pattern in where new technology entrepreneurs are much more business minded today than before. Consequently, if the quality of the teams behind NTBFs keep improving it could cause VCs to view NTBFs as a viable investment alternative given the premier importance they place on the team. However, given all the other barriers that exists and unless this coincides with a decline of digital companies, it is likely that this shift will be small.

5.2.2 Policy measures to incentivize the VC industry

It is important to note that the VC industry are under no obligation to invest in certain types of investments. They will always seek the investments which they believe maximize their own benefit rather than society as a whole. Consequently, if policymakers wish to maintain the belief that VCs is the solution to the ’innovation deficit’ and a key to continued technological development they need to incentivize the industry differently than today.

One way to incentivize the GVCs would be for the Swedish government to better align them with investments into NTBFs. Almi Invest, as mentioned in 4.3, lacks the muscle to be able to provide follow-on financing which dilutes their return compared to their risk. This conclusion is inline with the criticism Nightingale et al. (2009) direct towards GVC structures in the UK market. They argue that there is a need to allow these types of firms to hold their investments under a longer time period and over that time provide more financial resources than initially expected. Industrifonden currently acts as a TVC and could be realigned to take on more new technology investments. The third major investment vehicle under government control is Saminvest, created in 2016, uses a fund-in-fund structure where they invest into private funds. This is concerning for NTBFs given the preferences of private VC funds, implying that Saminvest currently are not positioned towards NTBFs. There is a potential for Saminvest to function as a guarantor wherein the fund guarantees a certain percentage of an investment into a NTBFs. This would reduce the risk for TVCs making such an investment perhaps making them more inclined to do so.

Ideally, the government restructures their GVCs into two parts as a compliment to the TVCs. One part should provide new companies with seed and early stage financing regardless of business idea, given the late stage preferences of TVCs. Similarly to what Almi Invest is today but with a removed investment cap allowing the GVCs to make investments in subsequent rounds. The other part should be dedicated to financing of science-based innovations. This could be a part of an entire ecosystem where VINNOVA and the universities acting as the initiator of research while the GVCs act as the next step moving the innovation from the lab to the market. Once the firms start to mature and change their risk profile, they could be handed off to TVCs. This set-up likely requires a thoughtful approach where
the government hedges the GVCs from the increased risk associated with NTBF investments. Perhaps there is a need to scrap the capital preservation requirement, giving them additional capital if required. However, there is a trade-off to ensure that investments are made wisely and not squandered on investments with little prospect of success.

The government could also focus on improving the relative attractiveness of NTBFs by improving the ability of those commercializing new tech. Here, science environments such as universities could offer training for researchers, improving the managerial and business skills of those wishing to commercialize their inventions. Emphasis could be placed on improving leadership and constructing a viable business plan for the VCs to evaluate, in line with the concerns raised by our respondents in this thesis (see 4.2.4).

To conclude, it is unlikely that VCs will shift by themselves given the current sweet-spot they are in. There are a few passive exogenous events that could take place such as a changing of risk return profile of digital companies or a new technological revolutions. Although they will likely occur at some point in time the most direct and fastest way of causing a change would be for the government to make policy changes. Realigning GVCs and improving relative attractiveness are two examples that can be done.

5.3 The role of other investors in the supply for NTBFs

The purpose of sections 5.3-5.5 is to put funding of NTBFs into a wider context, drawing on information provided by the respondents under the interviews. These sections depart from the findings and purpose of the study to provide a first glance into the wider context of NTBFs funding from which other research can depart. In these sections, other supply sources are considered and a short discussion regarding demand is presented. Lastly the concept of 'thin markets' is introduced.

5.3.1 The role of business angles and family offices

In this section it is discussed whether informal venture capital such as business angles and family offices have different preferences that make them more inclined to fund NTBFs. A short discussion regarding their capabilities to invest into NTBFs concludes the section.

The preferences of VC makes them investing in NTBFs unlikely. But, could there be other actors with different preferences than the VC firms that are willing to supply capital to NTBFs? Several of the respondents believes so, that there are other actors with other preferences, making them more inclined to invest in new technology-based firms. For example, it was suggested that new business angels have entered the field and that these are less risk averse, investing in early stages:

“We have 180 billionaires in Sweden, out of which 120 have become billionaires the last 10 years. They are not investing other people’s money but have earned some
billions on gaming or betting and have some billions to do something fun of. It’s serial entrepreneurs that have earned such a great amount of money that they now can invest in whatever they want - and they often have more capital than the VC funds.”

(Respondent 7, Founder and partner of TVC)

“Business angels enter at earlier stages than the VC does. For many of them, it’s some money from gaming. It’s very obvious that it is money that they are willing to lose. They invest because it is exciting, while we invest because we have to earn a living on it. It’s a totally different mindset.”

(Respondent 1, Investment manager at GVC)

The fact that business angels and family offices aren’t limited by a closing fund was also put forward as an argument to why they should be more prone to investing in new technology-based firms:

“I believe that there is a large amount of business angels or family offices that realise that they have the privilege to have a long term perspective since they don’t have to close a fund and invest in new technology.”

(Respondent 2, Former investment manager at GVC)

However, there seemed to be diverging opinions regarding whether or not the business angels have sufficient amount of capital to invest in new technology-based firms:

“Private investors often don’t have the capital required to support new technology-based firms up to the stage where venture capitalists are willing to invest.”

(Respondent 5, Founder and partner of TVC)

Respondents also express a concern, that the above mentioned actors, just like the VCs, prefer to make investments in companies with shorter time to market and that new technology-based firms, due to their unfavorable characteristics, are more exposed:

“On the other hand, I also believe that there is a significant risk that actors like business angels and family offices also prefer investments that give fast returns.”

(Respondent 2, Former investment manager at GVC)

It can be concluded that whether business angles or family offices are more inclined than VCs to invest into NTBFs is unclear. It should be noted that our respondents are not business angels themselves and thus could lack the insight into these investor segments. However, they interact with these groups regularly when investing why there insights likely are valid.

Given the problems raised by our respondents and the existing research on the informal venture capital there is a reason to be skeptic that they would be able to replace the supply void created by the venture firms. Informal venture capital, such as business angels typically invests less than $100 000 (Mason and Harrison, 2004;
Aernoudt, 2005) which likely is not enough capital to develop a new technology firm to the point where the criteria from a VC perspective are fulfilled. In addition, Mason and Harrison (2004) note that technology investments are made by business angels with previous experience in the same areas. Considering that our respondents note the current business angels tend to have a background in gaming, e-commerce and betting, this seems like an ill fit. It needs to be noted that research in the current context remains limited and further research is required to understand the capabilities, preferences, and limitations of the contemporary informal venture capital market.

5.3.2 The potential of alternative supply sources

This section discusses the potential impact of other supply sources than those mentioned by the interviewees. First established sources such as business angel networks and CVCs are reviewed. Second, new supply sources established in recent years such as university funds, IP investments and Crowdfunding are briefly discussed.

Examining other supply avenues also provides an unclear picture whether they are inclined to invest into NTBFs or not. As mentioned above, business angels operating alone are likely to be limited in their funding capability. However, organized business angel networks could potentially be better positioned to fund new technology in the early stages until its ready. A Swedish example is STOAF which claim to invest into “advanced technology and future fast-growing companies that will create new industries and make a difference in the world”. Although their first two funds have been minor in size they are currently attempting to raise a 500 million SEK fund with the explicit purpose of bridging the gap between early stage and late stage for new technology based firm (STOAF, 2018). Hence, there is a possibility that angel network such as these will be able to invest into NTBFs.

Corporate venture capital have long been present on the venture capital market and should theoretically be perfectly aligned with NTBFs due to their strong strategic goals of obtaining competitive advantages through leveraging technology. However, CVCs are highly inactive on the Swedish venture market compared to other actors. In 2017, CVCs were involved in merely 4% of the technology deals made (Industrifonden, 2017). While that figure is small it could be allocated towards NTBFs making them a significant player in the funding landscape. This would require further research to determine.

In addition to angels and CVCs, in the past few years other new potential supply sources have appeared. These include actors such as university based funds, IP-based investment funds, and crowdfunding (Block et al., 2018). Due to their newness relatively little is known about these investment vehicles (Block et al., 2018) although some information give useful clues about their potential impact.

University based funds are primarily concerned with funding research (i.e. pre-seed) with an intent of future commercialization. However, they only provide small amounts for IP protection and very early stage development, but their finances are not enough to accommodate large investments in commercialization (Wright
et al., 2006). Hence, while they provide capital they are more likely to improve the relative attractiveness of NTBFs by helping them refining their product, improving their business plan etc. However, it will not affect the supply on the market itself.

IP-based investment funds buys the intellectual property, such as patents from firms thus providing neither equity nor debt. Clearly, this targets NTBFs and could help initial supply but the benefits appear limited upon further examination. Firstly, by merely purchasing the IP there exist no possibility of follow up funding, nor can any business support be obtained from these firms. Secondly, by relinquishing the IP rights the start up becomes significantly less attractive to corporate buyers and venture capital investors, as noted by our research (see section 4.2.2).

Crowdfunding can provide capital to young firms through donations, debt and equity. Donation and debt crowdfunding typically has smaller deal sizes around $40 000 while equity crowdfunding averages around $250 000 (Block et al., 2018). Based on deal size, equity crowdfunding could be a avenue for NTBFs, factoring in the possibility to raise follow-on finance. The issue is that crowdfunding does not provide any business support which NTBFs typically need. One could envision that if there existed other programs providing business support (e.g. university programs discussed in 5.2.1), they could complement crowdfunding enabling NTBFs to develop properly.

The conclusion is that out of all other options explored in sections 5.3-5.3.1, business angel networks, CVCs and crowdfunding complemented by business building programs could be viable alternatives to supply capital to NTBFs other than the VC firms. However, whether preferences in these investor segments are aligned with NTBFs or not remains unclear and there is a need to further explore these supply avenues.

5.4 Demand for capital by NTBFs

This section shortly describe the demand side of capital for NTBFs and how there seems to be a shortage in firms commercializing new technology.

Apart from the supply of capital to young firms, the respondents also noted that one in the discussion regarding the funding landscape for new technology-based firms must consider the demand side of the equation as well. Several respondents pointed out that the quality of firms emerging with new technology each year is very limited. Consequently, the issue regarding development of new technology through nascent firms could be seen as demand side problem.

“There are only 5 companies or ideas per year in this country that come from the universities and that have the potential to become something great.”

(Respondent 3, Former investment manager at GVC)

Several respondents suggested that this low demand can be attributed to the fact that researchers own their IP and aren’t themselves interested in commercializing the invention:
“The fact that researchers own their IP, and that no one can take it from them, is de facto a barrier to commercialisation. If there’s never a risk that you will lose your IP, you can just put it in the drawer. Researchers are primarily researchers because they want to explore their domain. They are not entrepreneurs that want to change the world with their technology.”

(Respondent 2, Former investment manager at GVC)

It is important to note here that these opinions regarding the demand are from VCs which are not specifically looking for new technology base firms, as established in the current study. Further research is required to fully understand what the demand side looks like. On the other hand, the respondents are industry experts and could thus be assumed to have a fairly accurate view of the current situation.

5.5 Thin markets for NTBFs?

This section discusses how demand and supply can interact to create a 'thin market’ and how it creates barriers generating a sub-optimal equilibrium point that requires interventions to move away from. The section ends with a short discussion regarding the implications of a thin market on technology development.

5.5.1 General implications of a thin market

If both demand and supply is limited for NTBFs then there will be a need to address both sides to improve commercialization rates for nascent new technology firms. Such a limitation on both sides has been captured in previous research. In their paper, Nightingale et al. (2009) introduces the concept of a 'thin market’. On ‘thin market’, there are limited number of investors and start-ups within a specific area, which implies that the two parts have difficulties in finding and contracting with each other at reasonable costs. This offers a possible explanation as to why the issue for that new technology firms persists.

The issue with a thin market is that it likely creates barriers both for firms and for investors to enter. Similar to the chicken and egg paradox (Grilli and Murtinu, 2014), a shortage of equity implies a reduced future deal flow of new technology based firms. At the same time the reduced deal flow makes it difficult for VCs and other investors to identify potential investments and to gain experience investing into these types of firms. This is significant since VCs have a tendency to forget insights from previous investments decisions and their likelihood of making a type of investment decreasing with the dormancy of their investment experience in that type of investment (Dimov et al., 2012). This is similar to the findings in our research that state that VCs invest into what they know and feel comfortable with, currently digital companies. It is likely that these finding apply to other types of investors as well, such as the informal venture capital given that it is still individuals which make the investment decision regardless through which investment vehicle (VC, BA, FO, crowdfunding etc) it is. Consequently, as discussed in 5.2 investing in a new technology or industry might
require exogenous shift changing how NTBF investments are identified, appraised and pursued. The difficulty is that this shift must coincide with an improvement in the number and quality of firms that emerge from science driven environments attempting to commercialize new technology. Consequently, a thin-market likely creates a lock-in effect which keeps the market at a sub-optimal equilibrium point.

5.5.2 Implication of a thin market on technology development

As noted in the introduction, it is the failures of young firms attempting to commercialize new technology that is holding the innovation rate in Europe behind. Given that very little support exists from VCs, there’s a significant chance that these failures will persist unless other actors discussed in this chapter is able to take its place. The result is likely that the innovation rate keeps being below necessary targets.

Consequently, there is a significant risk of economic stagnation if new technologies are unable to be properly commercialized. While incumbent firms in current industries do their fair share of R&D it is the new small firms radical ideas completely different from current structures that could be able to provide the jump in development that is required for sustained economic growth. Hence, if there is a lack of funding for these types of firms it must be addressed urgently. Initiatives discussed in 5.2.1 are few examples of what could be done but there’s likely a need for a holistic approach that considers all actors on the supply and demand side simultaneously and designs a strategy that incentivizes both sides to work together in unison to improve the funding landscape for NTBFs.
6 Conclusion

In this section the findings regarding the position of the Swedish VCs in the funding landscape of NTBFs are concluded. Thereafter, the study’s contributions and limitations and presented. Finally, the suggest areas for future research are described.

6.1 Conclusion on findings

In order to understand some of the factors impacting the emergence and development of NTBFs and subsequently social and economic growth, this thesis studied the interaction between NTBFs and venture capitalists. This was done because VCs are perceived to be an important actor in the commercialization process for these types of firms. More specifically, the purpose of this thesis was to understand the position that Swedish Venture capital take in the funding landscape of NTBFs. The position was deduced by delineating and comparing the alignments of the preferences of the VC industry and investments in NTBFs.

The thesis concluded that the Swedish TVCs and the GVC Industrifonden are strongly driven by the aim for maximizing financial return, are risk averse and prefer to allocate large amounts of capital at once. Evidence of the existing preferences was not only found in the empirical material but was also supported by existing research. The GVC Almi Invest was found to have a slightly different approach, seeking riskier investments and making smaller allocations per investment. Further, the study indicated that the Swedish VCs make broad investments, invest in domains where they are knowledgeable and put great emphasis on the team when investing. The latter findings are supported in literature. In line with what literature suggests, the study also revealed that VCs today are targeting digital companies that are software-based and internet-enabled as these offer attractive returns. It was also put forward by the respondents that these companies offer straightforward distribution channels, enabling a quick and cheap testing of market acceptance. However, for the companies to succeed and win the race to become global leaders, significant amounts of capital is needed. In other words, the predominant risk that VCs face when investing in these companies is whether the firm will be able to secure the market before other competitors enter. By comparing these characteristics with the found preferences of VCs, one understands that the digital companies are aligned both with the VCs risk preferences and with the willingness to invest large amounts of capital at once.

What this study revealed regarding NTBFs is that VCs perceive the teams of NTBFs to be lacking. This notion is strongly supported by literature. Yet, it is important to note that it does not seem as research has attended to whether or not the teams truly are lacking. Nevertheless, both respondents and literature contend that a consequence of the lacking teams is that VCs need to engage in business building. The interviews indicated that VCs have no interest in this part. Further, hat literature contends, and what could be understood from comparing the lacking teams to the preferences of NTBFs, is that NTBFs are mismatched with VCs strong emphasis on the team.
The interviews also revealed that investments in NTBFs are perceived to be associated with high risks. In line with literature, the interviews indicated that uncertainty is compounded due to the novelty of the technology. Not only is there a risk related to the viability of the technological, but evaluating the potential market size is also difficult. The difficulties when evaluating are indicated to be increased for VCs that have limited experience of investments in NTBFs. Given that the VCs target digital companies, it is difficult to imagine that the industry possesses the experience, knowledge and networks that enables investing into NTBFs. Investments are also perceived particularly risky as VCs face difficulties in reducing risk through syndicating. According to respondents, few investors are willing to invest in NTBFs. An alternative explanation to the difficulties to syndicate may be that the network of the specific respondents aren’t interested in investing and that searching for other interested investors is costly. Finally, NTBFs were perceived to require large amounts of capital in initial stages, which also adds to the riskiness as uncertainties are significantly greater in early than later stages. These aspects compound the risk regarding NTBFs and create a risk profile which one can understand is ill-suited for Swedish TVCs and GVCs today as they have become increasingly risk averse since the dot-com crash.

In addition, a finding was that the longer development times of NTBFs make it difficult for VCs to exit them before the closure of their funds. This issue is especially related to TVCs using the standard LP structure and not GVCs such as Industrifonden and Almi Invest which have an evergreen structure. Respondents also put forward that the long time to market add to the riskiness as substitutes may emerge during the development. Along the same lines, the conclusion can be drawn that if an investment has a long time to market, the potential of the investment needs to be significant due to the time effect on return. This may pose a barrier to investing.

The significant funding was indicated to be particularly challenging for small funds. As literature contends, an explanation therefore is that their investments are diluted as new investors enter the firm (Murray, 1999). As Almi Invest’s investments are capped, it seems as they too face particular challenges for investing.

All together, the current study revealed an extremely complex interaction between VC preferences and investments into new technology-based firms. However it was clear that both TVCs and GVCs rarely invest in NTBFs due to the extensive mismatches between preferences and NTBF investing and the availability of a better aligned alternative, namely digital companies. Conclusively, our findings show that Swedish TVCs and GVCs are not significant investors into NTBFs.

6.2 Contributions

The main contribution of this study is the insights it provides regarding the VCs’ position in relation to NTBFs. These insights were gained through analyzing the alignment between the investors’ preferences and the characteristics of new technology-based firms. As this approach, to the extent of the authors’ knowledge, has not been attempted previously, the study has made a analytical contribution. By adopting
this approach, the study revealed many relevant barriers to investing in NTBFs that earlier research focused on one perspective has not emphasized. Hence, the thesis has contributed to research by providing an understanding of the Swedish venture capital industry and its investments in new technology-based firms which previously did not exist.

The study also contributes to research by extending the knowledge regarding the contemporary preferences of VCs and its perceptions of NTBFs. With its historical perspective, the study has also responded to the call for research with temporal context. Further, a contribution of this study is the insights it has provided regarding the preferences and perceptions of Swedish venture capitalists specifically. Hitherto, research on Swedish venture capitalists and their investments into new technology has, to the extent of the authors’ knowledge, been scarce. By focusing on the Swedish market, the study also offers possibilities to gain further understanding regarding the differences between venture capitalists on different markets.

By providing understanding of the Swedish VCs’ investments into NTBF, this study is not only relevant for research in the field, but also for policymakers. From the thesis, policymakers can derive information regarding the funding landscape of NTBFs from a VCs perspective and use that when designing potential interventions, drawing upon the discussion in 5.2.

6.3 Limitations

As all other studies, this study has its limitations. Most of the limitations to this are discussed in depth in section 2.4. As described in section 2.4.1, a particularly important limitation of this study is that it used interviews to query VC regarding their investment decision rather than real-time methods. Real-time methods have received strong criticism for producing biased results as VCs seldom grasp their own decision-making process (Shepherd and Zacharakis, 1999) and as respondents have difficulties in recalling the true explanation and tend to rationalize their behavior (Sandberg et al., 1988). Further, the validity of this study was limited as some respondents no longer were active investors. Furthermore, participants were asked to have their name published which could reduce validity; however it improves reliability. In addition, the fact that new technology was not defined by the researchers is a limitation in the sense that one must carefully understand each personal construct of the respondents in order to understand the comments made regarding new technology-based firms.

6.4 Further research

In order to complement the current study, a quantitative study examining the deal flow between NTBFs and Swedish venture capital firms could be performed. The aim of future research could be to quantify the proportion of NTBFs in the portfolios of the VCs as well as look at the investment sizes compared to other firms. Research
could attempt to analyze this over time in order to draw conclusions regarding the current funding scenario for NTBFs in a VC context and potential future development. In order to complete such research, a definition of what classifies a firm as an NTBFs must be developed. Here, future research could draw upon existing literature as well as the definitions provided by our interview subjects. It is recommended that such a classification focus on the characteristics of the firm rather than subjective constructs surrounding the term 'new'. The research could be complemented with a quantitative analysis of the demand of capital from NTBFs in relation to the demand of capital from other firms.

As described in the discussion, it is necessary to study the supply of capital to NTBFs from different actors in order to understand what implications the contemporary position of the VCs has on innovation. To achieve that understanding, either a top down approach or a bottom up approach can be used. A top down approach could be a quantitative analysis attempting to map the existing capital from different sources to NTBFs. Understanding the actual capital flows from all actors to all investments should be enough to understand the funding landscape for NTBFs. The approach should be put in a temporal context in order to discern historic patterns. In addition, it would be prudent to analyze the impact of the current macroeconomic boom on the capital flows to different investments. Is there a difference in capital flows ratio-wise from economic down times? A bottom down approach could be similar research to ours but applied to the other actors noted in this thesis. The approach could either be qualitative or quantitative. Obviously a mixed approach would be ideal to understand the current context and discuss future development. Actors that should be analyzed include but is not limited to corporate venture capital firms, business angels, family offices, business angel networks and university funds. A comparative analysis between the preferences of these actors and that of VC firms could help understand whether our findings can be generalized to investors of any type.

Further research could also understand the NTBFs that are seeking funding. How many originate every year? How many of these seek funding? How many get funding? Research could not only compare these ratios to ratios of other firms, but also focus on understanding the dynamics around the contemporary situation.
7 Acknowledgements

First, we would like to express our gratitude to David Sonnek, who throughout the process has showed great enthusiasm and interest for our work. Thank you for your knowledge and insights and for being an endless source of ideas and suggestions. They have been invaluable to this thesis and much appreciated.

Second, we are also thankful to our supervisor Martin Vendel, who has encouraged us, challenged our perspectives and help us back on track when we have stumbled into challenges. Thank you for your feedback and guidance.

Thank you also to the participants in the study: for taking your time to meet us, for showing interest in our work and for sharing your experiences with enthusiasm and humour. You have sparked a great interest for the field and given us unforgettable memories.

We would also like to extend our gratitude to our friends and families, who with great patience have participated in discussions, listened to our complaints and encouraged us throughout the process.

Finally, a thank you to Yoda and Chelsie for providing laughter, exercise, distraction, and dirty clothes.
Appendices

Appendix 1: Interview questions

Intervjufrågor

Företagsspecifika frågor

– Kan du berätta om din bakgrund och erfarenhet av venture capital investeringar?
– Om GVC: Vilket uppdrag har X? Har uppdraget förändrats över tid? Hur påverkar uppdraget investeringar i bolag med ny teknologi?
– Investerar ni i bolag med ny teknologi?

Definition av ny teknologi

– Vad anser du är en ny teknologi?
– Vad tycker du är ett bra exempel på ett bolag med ny teknologi?

Utbud

– Varifrån kom bolagen med ny teknologi?
– Hur hade bolagen generellt fått finansiering tidigare?
– Ungefär hur stor andel av investeringsmöjligheterna är bolag med ny teknologi? Har det funnits tidpunkter med fler eller färre investeringsmöjligheter? Vad tror du eventuella svängdningar beror på?
– Ungefär hur stor andel av bolagen med ny teknologi investerar ni i?
– Hur skiljer sig detta mot investerinar i bolag som inte är baserade på ny teknologi?
**Preferenser och utmaningar**

- Vilka är de huvudsakliga anledningarna till att ni investerar/inte investerar i ny teknologi?
- Vilka är de största utmaningarna med investeringar i bolag med ny teknologi?
- Vilka kriterier anser du behöver vara uppfyllda för att ni ska investera i bolag med ny teknologi? Hur skiljer sig kriterierna för bolag utan ny teknologi?
- Befinner de sig i ett annat stadie än bolagen med ny teknologi?
- När ni valde att inte investera i ett bolag med ny teknologi, vilka var de primära anledningarna?
- Brukar ni syndikera? Skiljer sig detta vid investeringar i ny teknologi vs traditionella investeringar? Fanns det några särskilda skäl till att ni syndikerade/inte syndikerade i dessa situationer?
- Om en tänkt medinvesterar inte valde att investera, vad är din uppfattning att detta berodde på?
- Upplevde du att det finns skillnader mellan olika typer av aktörers kriterier för investering?
- Om TVC: Hur ser era limited partners på investeringar i ny teknologi? Påverkar deras synsätt era investeringar i bolag med ny teknologi?

**Generella frågor om industrin**

- Har kapitaltillgången påverkat era investeringar i traditionella bolag / bolag med ny teknologi? Hur?

**Övrigt**

- Har du förslag på vilka fler vi bör intervjuas för att få ett helhetsperspektiv på svenskt VC?

---

**Table 7: Interview questions**
Appendix 2: Interviewee backgrounds

The information provided in this section has been retrieved from various sources such as LinkedIn, Bloomberg, company websites and the interviews.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Anell</td>
<td>Joined the GVC Industrifonden in 2014 and co-leads the Technology team with Johan Englund. Gravitates towards investments with a highly technical nature, including the Internet of Things and other emerging technology. Started his career as an IP consultant, moved into robotics and automation and then later joined startups Proximion Fiber Optics and Mamea Imaging where he held different senior positions. Since entering the venture capital industry in 2008 he has gained years of experience from board management. Recent experiences from exit processes include Movimento, sold to Delphi Automotive, and Fält Communications, sold to Telia.</td>
</tr>
<tr>
<td>Johan Crona</td>
<td>Currently works as an investor into SaaS-firms. Prior Crona served as the CEO of GVC Almi Invest Stockholm between 2015-2017. Before being CEO, Crona also served as an Investment Manager at Almi Invest. He has a background in finance and business development with experience as a Founder and External Chief Executive Officer of several startup companies. He has over 10 years experience from starting and developing technology startups including 6 years with venture-backed companies. Before joining Almi Invest in 2010, Crona served as the Chief Executive Officer of Första Västmanlandsfonden AB, a regional seed capital VC-fund for companies in early stages. Before that, Crona served as the Chief Executive Officer of Protaurius AB, which he co-founded. Serves on the board of Scrive, Kundo, and Loop54.</td>
</tr>
<tr>
<td>Dag Sigurd</td>
<td>Currently working as a self-employed consultant focusing on semiconductors and electronics. Served as Investment Director at Industrifonden between 1998 and 2007. He was previously engaged in applied microelectronic research and development. Sigurd served on the board of many early stage high-tech companies during his time at Industrifonden. He served as the Chairman at MediaTek Sweden and Cypak and as a Director at Cobolt, Imsys, MySpace, Nanoradio, SiCon, KTH-Chalmers Capital to name a few.</td>
</tr>
</tbody>
</table>
Staffan Helgessson  Founded Creandum in 2003. Before this he was a Founder and the Managing Partner at Startupfactory, the first venture investor globally exclusively focused on investments in mobile internet startups. In addition Staffan has extensive management experience from IKEA, Procter & Gamble and McKinsey & Company. Today Staffan works with investments in all of Creandum’s focus areas, with a particular focus on enterprise products and services, as well as helping Creandum’s portfolio companies expand to the US.

Staffan Ingeborn  Founded InnovationsKapital in 1994 and serves as its Chief Executive Officer and Managing Investment Director. Serves as Non-Executive director for the international investment firm GP Bullhound. Also serves as Managing Investment Director of Apptus Technologies AB. In addition, he has been a Director of Spotfire, Enigma, Silecs, Oxeon, Xtract amongst many others. Ingeborn is one of the most experienced Nordic venture capitalists and pioneered the venture capital industry in the area. Prior to this, Ingeborn was a self-employed management consultant and private investor specializing in rationalizing and restructuring companies and leading turnarounds for banks and bank owned investment companies as the Chairman-for-Hire. Before his own consultancy, Ingeborn served as the Managing Director at Frico AB and led the IPO of the company.

Magnus Melander  Co-founder of THINGS which provides office space for IoT and other emerging hardware technologies. Became a venture capitalist when co-founding Brainheart Capital in 2000 and spent 7 years making investments within wireless technologies. Afterwards, he started a few consulting companies devoted to IoT, B3CC and WBird. Melander has had executive positions in management, sales, marketing, business development and venture capital.

Johan Hernmarck  Founder, Partner and Chairman of Provider Investment AB. He has invested in Nordic early and later stage start-ups since 1992. Raised venture capital funds through Provider Capital called IT Provider during late 1990s and early 2000s. Currently, Provider Investment is a family office investing into high tech startups. Hernmarck also served as the Director of Swedish Private Equity and Venture Capital Association (SVCA). He is also Co-founder of Ledstiernan AB which focused on investments into ICT firms.
Lennart Jacobsson  Co-founded Swedestart Management (now CapMan AB) in 1995 and was its Managing Partner until 2003. Currently serves as Senior advisor to CapMan AB. Also Co-Founded Euroventures Management in 1986 and served as its Investment Director and was its Senior Partner from 1986 to 1999. From 1983 to 1986, he worked as Investment Manager at Svetab which was one of the first Swedish Venture Capital firms. Has served on the board of several Swedish and Nordic companies.

Hans Landström  Professor in Business Administration with special in Entrepreneurship and Venture Finance, Lund University. Landström’s main research interests are entrepreneurial finance, venture capital, business angels, entrepreneurial education and the history of entrepreneurship. In addition to publishing 15 books and edited books, Landström has also published articles in Research Policy, Journal of Business Venturing, Small Business Economics, Entrepreneurship Theory and PRactive, Entrepreneurship and Regional Development, and Journal of Small Business Management. Furthermore, he conducts research for policy-oriented agencies.
Appendix 3: Overview of the TVCs

<table>
<thead>
<tr>
<th>Traditional VC</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creandum</td>
<td>A traditional venture capital firm founded in 2003. Have invested 4.3bn SEK into 61 companies across many different industries such as music, food, and fintech. Has an international focus but the biggest investments have been Swedish such as Spotify, Klarna, and Kry. Claims to invests across multiple stages with no singular focus.</td>
</tr>
<tr>
<td>Innovationskapital</td>
<td>A traditional venture capital firm for innovative growth companies in the Nordic region. The fund was founded in 1994 on the initiative of Chalmers University of Technology. At first investments was made directly into early stage companies spun off from academic environments. However, over time came a more wide approach, investing into firms from other environments and later stages. Currently in the process of divesting all portfolio firms and will cease operations once completed.</td>
</tr>
<tr>
<td>Provider Capital</td>
<td>In 1997 the traditional venture capital firm IT Provider was founded and the first IT Provider fund was raised in 1998. Provider has invested more than 3 billion SEK into more than 130 companies through investing directly or as advisor to the IT Provider Funds. The current investment vehicle, Provider Capital AB, is not bound by any funds and operates as an evergreen investment firm. It invests in all stages, from seed to publicly listed companies, but venture growth is the primary target.</td>
</tr>
<tr>
<td>Brainheart</td>
<td>Founded in 2000, the firm established an eight-year-long venture capital fund with around $200 million together with an experienced team of individuals from the IT/telecom industry. The Brainheart Fund became the largest European venture fund dedicated to wireless technology and applications. Started in 2013 to invest into Cleantech by acquiring a group of companies in the area of rockenergy technologies and services. Currently invests into ICT, Cleantech and Education.</td>
</tr>
</tbody>
</table>
Swedestart

Founded in 1995, the traditional VC firm initially focused on early stage Swedish tech companies. Initial fund size was at 80 million SEK. Subsequent funds grew in size and were more later staged focused. The second fund was at 184 million SEK while the third and final fund was at 750 million SEK. The later funds had a wider geographic focus with investments throughout the Nordics. The firm was purchased by CapMan in 2002 and continued their funds under the CapMan name.
References


Morse, J. M. (1994), Critical issues in qualitative research methods, Sage.


