Commercialization Activity and Support Structure of Swedish universities

Master thesis within Business Administration

Author: Einav Peretz Andersson
My Ljungberg

Tutor: Anders Melander

Jönköping 2011-05-23
Master Thesis within Business Administration

Title: Commercialization Activity and Support Structure of Swedish universities

Author: Einav Peretz Andersson
My Ljungberg

Tutors: Anders Melander

Date: 2011-05-23

Keywords: University, Commercialization, The Swedish Paradox

Abstract

Knowledge and technology has in recent decades become a driving force of economic growth and national productivity (Goldfarb & Henrekson, 2003). This recognition has had an impact of the universities' core mission. Traditionally, the core mission of universities has been teaching and researching, but nowadays the universities are also expected to take on an active role in commercialization of the research result as a part of their mission. The Swedish government invests heavily in R&D and perceives the investment as vital for the innovation system. However, the high investment have caused a lot of controversy and debates due to the perception of low innovation output in relation to the investment, a phenomenon which is generally known as “The Swedish paradox”. The Swedish paradox is influenced by several factors, one of them is that the high expenditures in university R&D generates poor outcome in relation to the investments (Henrekson & Rosenberg, 2001; Goldfarb and Henrekson, 2003). The purpose of this thesis was to explore how Swedish universities’ influence the Swedish paradox through their commercialization activities and support structures. Commercialization activities refer to the various activities which universities may choose in order to commercialize its research, including patenting, licensing, spin-offs and human capital activities. The support structure refers to the structure which the universities use to facilitate commercialization. In order to fulfill the purpose a multiple case-study approach was chosen in which semi-structured interviews were conducted. The chosen universities in the study were Halmstad University, Jönköping University, Linnaeus University and Lund University. The underlying reason for the chosen approach was that the material needed to answer the purpose was to be found in a qualitative approach.

The main finding of the study is that there exists insufficiencies in university commercialization activities and support structures which may explain why research results tend to remain at the universities, hence influencing the Swedish paradox. The results gave indications of; the tendency of too complex commercialization systems, lack of encouragement of researchers’ involvement in commercialization, the modest use of collaborative agreements for collective efforts in commercialization and low prioritizing of licensing and patenting, and finally, the necessity of a culture which advocates commercialization and senior management support who places commercialization as a central issue. This study leverages an insight into universities commercialization and its influence on the Swedish paradox, the result of this study is valuable for both universities, in order to improve their commercialization performance and for the region and nation for a possibility to increase the output of university commercialization.
Acknowledgements

We want to take the opportunity to thank a number of people who have been important for the fulfillment of the thesis.

Our tutor, for his commitment and guidance;
Anders Melander, Associate Professor in Business Administration.

* * *
We want to thank all respondents who participated in the conducted interviews and the persons who proofread this thesis.

Einav Peretz Andersson & My Ljungberg
Jönköping, May 2011
Table of Contents

1 Introduction ...................................................................................... 6
  1.1 Problem discussion ...................................................................... 8
  1.2 Purpose ........................................................................................ 9

2 Disposition of thesis ........................................................................ 10

3 Frame of Reference .......................................................................... 11
  3.1 Commercialization ....................................................................... 11
    3.1.1 National Institutional Context ....................................................... 13
    3.1.2 Commercialization Activities ...................................................... 14
      3.1.2.1 Patenting and Licensing .............................................................. 14
      3.1.2.2 Spin-off ..................................................................................... 15
    3.1.3 Human Capital Activities ........................................................... 16
    3.1.4 University Support Structure ..................................................... 18
      3.1.4.1 Technology Transfer Office ....................................................... 18
      3.1.4.2 Science Park and Incubators ................................................... 19
      3.1.4.3 Holding company ................................................................... 20
  3.2 Research Questions ....................................................................... 21

4 Methodology .................................................................................... 22
  4.1 Research philosophy ..................................................................... 22
  4.2 Research approach ....................................................................... 23
  4.3 Research Design ........................................................................... 23
    4.3.1 Qualitative research .................................................................. 24
    4.3.2 Case Study .................................................................................. 25
    4.3.3 Interviews .................................................................................... 26
    4.3.4 Material analysis ........................................................................ 28
    4.3.5 Quality assessment of the thesis ................................................ 29
      4.3.5.1 Generalizability ...................................................................... 30

5 Empirical Findings .......................................................................... 31
  5.1 Halmstad University ..................................................................... 31
    5.1.1 Commercialization Activities ................................................... 32
    5.1.2 University Support Structure .................................................... 32
  5.2 Jönköping University .................................................................... 35
    5.2.1 Commercialization Activities .................................................... 36
    5.2.2 University Support Structure .................................................... 37
  5.3 Linnaeus University ...................................................................... 39
    5.3.1 Commercialization Activities ................................................... 40
    5.3.2 University Support Structure .................................................... 41
  5.4 Lund University ............................................................................ 43
    5.4.1 Commercialization Activities ................................................... 44
    5.4.2 University Support Structure .................................................... 45

6 Analysis ........................................................................................... 48
  6.1 National Institutional Context ....................................................... 48
  6.2 Commercialization Activities ....................................................... 49
    6.2.1 Patenting and Licensing .............................................................. 49
    6.2.2 Spin-off ....................................................................................... 52
    6.2.3 Human capital activities ............................................................. 53
  6.3 University support structure ........................................................ 54
    6.3.1 Technology Transfer Office ....................................................... 54
1 Introduction

In recent decades knowledge and technology has become a driving force of economic growth and national productivity (Goldfarb & Henrekson, 2003). The rapid growth of a knowledge-based economy has further underscored the importance of both promoting university research and graduate education, and of ensuring knowledge transfer from the universities into communities, governments and businesses (The Canadian Association of Research Libraries, 2001). Universities are considered institutions which generate knowledge, encourage the diffusion of new ideas, and create skilled personnel and entrepreneurs (Breznitz, O’Shea & Allen, 2008). This recognition has put more emphasis on the role of the universities in both regional and national development, and government agencies are constantly seeking to increase the commercialization of university research (Bonaccorsi & Daraio, 2007).

Traditionally, the role of the university was to educate students and to conduct basic research (Breznitz, et al. 2008). In the 1980s the role of the universities was redefined and it became a significant trend in the USA for universities to participate more in knowledge transfer activities. The encouragement of university research commercialization started with the establishment of the Bayh-Dole Act in 1980 in the USA. The Bayh-Dole Act implied an expansion of the technology transfer role of the universities; it gave universities the possibility to own Intellectual Property (IP) derived from government-financed research. However, the universities were required to make the best effort to commercialize it, so that the public could enjoy its benefits (Martin, 2007). The Bayh-Dole Act changed the universities’ role in the society, it created both opportunities and obligations, and until this point, universities were not organized in a way that they could deal with e.g. licensing, marketing, or managing their research (Martin, 2007).

Nowadays, universities are expected to commercialize their research in addition to teaching and research (Rasmussen, Moen & Gulbrandsen, 2006). Commercialization activities refer to what the university does in order to commercialize. These activities include patenting, licensing, spin-offs, collaborative research, shared personnel, labor movement. It also includes initiatives to support commercialization projects such as technology transfer office (TTO), collaboration with holding companies, business incubators, Science Parks, etc. OECD\(^2\) (2010d) points out that universities are required to justify public investments by conforming that new and innovative ideas are reaching their ways to commercial use quickly and in increasing quantities. The result of these activities is “an explosion of technology transfer centers, a new priority to create spin-off companies and an increasing interest by governments in the higher education expenditure on research and development (R&D)” (p. 1). Universities have considered these activities as a way to increase funding and investments (OECD, 2006c).

---

1 Definition of commercialization “the process of translating research knowledge into new or improved products, processes and services, and introducing them into the market place to generate economic benefits.” (Isabelle, 2004, p.140). This definition is a core definition which will be expended in the frame of reference.

2 Organization for Economic Co-operation and Development (OECD)
An effective distribution of knowledge between universities to the private sector depends on the regulation of each country, such as Intellectual property rights (IPR), and on effective systems which mediate between the institutions (Kitagawa & Wigren 2010).

The literature discusses several countries with different commercialization models, where Sweden and USA are two countries with opposite models. Both countries invest a lot of resources into university R&D, but follow very different models for commercialization. Ever since the implementation of the Bay Dole Act universities in the USA owned the right to patented inventions. The USA model implies a bottom up structure, and is focused on economic incentives in order to find commercial opportunities for the universities research results and then allowing them to find the most attractive activities to commercialize (Goldfarb & Henrekson 2003). In contrast, the Swedish model implies a top-down structure which means that the government enacts a set of policies facilitating commercialization. Furthermore, in the Swedish context the teachers’ exemption (lärarundantaget) gives the researcher the right to receive the entire benefits derived from the IP – a system which also requires the inventor to bear the cost of patenting (Goldfarb, & Henrekson, 2003; Wallmark, 1997). It is widely argued that the Swedish model may not be favorable to commercialization since universities have nothing to benefit from allowing researchers to engage in commercialization activities. However, since the Swedish inventor has the right to negotiate agreements with the university whereby part of the invention falls to the university, it means that the only difference to the US system is where the ownership rests from the beginning (Karlsson, Stough & Johansson, 2009).

In the Swedish model the state plays a vital role in education and research. According to the Ministry of Education and Research (2010), the Swedish state is investing significantly in areas of research that are important for the business sector. A general perspective on the role of universities and institutes is to contribute to the competitiveness of the business sector as well as to increase the cooperation between the business sector and the universities (Ministry of Education and Research, 2010). Thus, the Swedish government is developing policy models to support commercialization. These support programs are managed by different governmental agencies and among the most important ones are Tillväxtverket, Almi, Vinnova – the Swedish Governmental Agency for Innovation System; and Innovationsbron.

---

3 Tillväxtverket is aiming to work to achieve more enterprises, growing enterprises and sustainable, competitive business and industry throughout Sweden (Tillväxtverket, 2011)

4 Almi Företagspartner AB task is to promote the development of competitive small and medium-sized businesses as well as to stimulate new enterprise with the aim of creating growth and innovation in Swedish business life (Almi, 2011)

5 Vinnova is Sweden’s innovation agency. The mission is to promote sustainable growth by financing R&D and developing effective innovation systems by integrating research and development in technology, transport and working life. (Brundenius, Göransson, & Ågren, 2008)

6 Innovationsbron offers expertise, capital and processes to identify commercial ideas, verifying, selecting, investing, business development and deliver business and business-to-market. Innovationsbron focuses on turning research and innovation into business (Innovationsbron, 2011a)
1.1 Problem discussion

In the beginning of the 90s there were considerable innovation policies debates in Sweden caused by a low innovation output from heavy investments in R&D, the so called ‘Swedish Paradox’. There are several formulations of the Swedish paradox but one of them is that the Swedish innovation system is not capable enough of generating output related to inputs (research capital vs. commercial results), in other words, Sweden is inefficient in transforming its high R&D expenditures into productivity and growth (Klofsten, 2002; Andersson, Asplund, & Henrekson, 2002).

However, some researchers argue that comparing R&D figures may be misleading, and claim that the high figures of Sweden originates from specific Swedish features such as the high dependence on a few large firms (Ejermo, & Kander, 2009). Furthermore, in recent years Sweden has on average been higher than other OECD countries when comparing gross domestic product (GDP) /capita (growth), which means that Sweden is not underperforming compared to other OECD countries. Thus, an issue is of course if Sweden is underperforming in relation to its R&D investment. Edqvist (2010) stresses that since the Swedish Paradox concept was coined, there have been significant improvements regarding the output of innovations. However, Edqvist argues that the Swedish paradox still exists since the Swedish government still is heavily investing in R&D while the output in relation is low.

One significant factor in the Swedish paradox is the high expenditures of university R&D with a poor output from the investment (Henrekson & Rosenberg, 2001; Goldfarb and Henrekson, 2003). Sweden’s total R&D expenditure and spending in the university sector as a percentage of GDP, is one of the highest in the world, see figure 1.1 (OECD, 2003b).

Measured in terms of both resources and publishing, Swedish university research is however prominent. Unfortunately, the effort in R&D investments in the university sector is not translated into the expected extent of commercial activities and one of the factors affecting the Swedish paradox is that the R&D results remain in the universities (and other research institutions) and are not commercialized (Edqvist, 2010). Henrekson
and Rosenberg (2001) point out that the Swedish government has attempted to address the failures in commercialization. In 1998 a policy was formalized where universities;

“are exhorted to be open to influences from the outside world, disseminate information about their teaching and research activities outside academia, and to facilitate for the surrounding society to gain access to relevant information about research results. Each university is also obligated to draw up and implement its own path for collaboration with the surrounding society.” (SOU, 1998, p. 11).

The policy gives the universities more freedom in finding their own path and initiatives to commercialize, which means that each university have the possibility to own unique ways to address the issue. By comparing different universities one can gain a better understanding of how Swedish universities address commercialization and how this can be related to the Swedish Paradox.

1.2 Purpose
The purpose is to explore how Swedish universities’ commercialization activities and support structure influence the ‘Swedish paradox’ (high R&D expenditures and low innovation output).
2 Disposition of thesis

The introduction includes a brief background to the problem area as well as a presentation of the purpose and the stated research questions. The object of the frame of reference is to provide an insight to the research area and to review relevant literature in the research based on the purpose of the study. The methodology outlines the approach used in order to fulfill the purpose of this study and includes an argumentation around chosen research method and data collection techniques as well as a quality assessment of the project. Empirical findings provide a presentation of the collected data derived from four case studies. In the analysis chapter the collected data will be analyzed in accordance with the generic model in the frame of reference. The discussion is based upon the empirical data analyzed in the previous chapter and is an attempt to answer the purpose of the study. The conclusions as the last chapter presents the conclusions derived from the analysis and the discussion chapter.

![Research structure](image)

Figure 2.1 Research structure
3 Frame of Reference

The frame of reference will give an overview of concepts related to university commercialization. These concepts are important for the reader in order to comprehend the following chapter.

3.1 Commercialization

As a social institution, the university has in recent years been forced to change in accordance with its commercialization activities (Mckelvey & Holmen, 2009). Various studies on commercialization did not succeed in creating a universal definition of this term, a term which is basically borrowed from theories of business. Commercialization definitions within these business theories are equally complex (McCoy, Badinelli & Thabet, 2008). One of the definitions of the term is that commercialization of technology is the process of taking research results as they emerge from the laboratory into new or improved products, processes and services and bringing them to a successfully marketable product (Isabelle, 2004).

Cripps, Yencken, Coghlan and Anderson (1999) claim that a number of activities have been identified by which university commercializes their research; publication, education/training, collaborative research; shared personnel, labor movement, patenting and licensing. For very long, licensing and patenting have been the main focus and authors have studied policy issues related to licensing by universities. Later on spin-off firms have received increased attention in literature (Cripps et al. 1999).

In the literature discourse of models of commercialization, Dorf and Worthington (1987), discuss several models for use to commercialize research; the Licensing Model, where a firm is granted the possibility to develop the technology due to given exclusive rights from the university; the Venture Capital Model, where venture capitalists decide the potential of the technology on behalf of entrepreneurs; the Large Company – Joint Venture Model, which focuses on companies sending employees to the research environment with the aim of returning with the technology; and the Incubator – Science Park Model, in which individuals who want to commercialize the technology are supported by various tools. According to Dorf and Worthington (1987), certain benefits to different parts of the commercialization of technology can be found in these models, and if the models are combined they would probably be suitable for any specific use. Finding a theoretical model for university research commercialization is however rather problematic. Breznitz, et al. (2008) describe the activities taken by the university in order to commercialize as the creation of spin-offs and collaboration with industry. Mian (1996) claims that the role of university in commercialization relates to business incubators, while Bercowitz and Feldmann (2006) stress that commercialization is considered to be patents, licensing and spin-offs. According to scholars, knowledge transfers from universities are made possible through the active involvement of universities’ inventors hence academic entrepreneurship is specifically considered to be very effective when it comes to technology transfers (Henrekson & Rosenberg, 2001; Slaughter & Leslie, 1997).

Mckelvey and Holmen (2009) present a model (see figure 3.1) in which three elements are considered as having effect on university commercialization: national institutional context, the university and research group. The model also stresses the importance of building support systems for commercialization which may include TTOs, Science Parks/Incubators, holding companies etc.
Having defined commercialization and identified concepts around the topic, led the authors of this thesis to construct a generic model which reflects the current literature (see figure 3.2). The model is based partly on McKelvey and Holmen’s conceptual model and encapsulates four major categories, (I) the national institutional context, (II) the university, (III), the various activities which universities may choose in order to commercialize its research, and (IV) the support structure that the universities use to facilitate commercialization. The frame of reference is structured around three topics, *National Institutional Context*, *Commercialization Activities* (patenting, licensing, spin-offs and human capital) and *University Support Structure* (TTO, holding company, Science Park and Incubators).
3.1.1 National Institutional Context

Organizations such as firms, universities, schools and government ministries are components in the “system of innovation”\(^7\) and in the creation and commercialization of knowledge. The behavior of these organizations is shaped by regulations, such as laws, rules, norms, and routines, which constitute incentives and obstacles for innovation. (Edqvist, 2005). The centralized system in Sweden denotes the government as the body which grants the universities their rights and in practice decides the rules and university size (through budget allocations). The Swedish top-down model means that mechanisms, policies and institutions designed to facilitate commercialization are designed from the top. In contrast, the US system is based on a bottom-up model in which legal structures are designed to encourage a spontaneous emergence of appropriate incentives structures from the universities themselves (Henrekson, 2002). Furthermore, according to Henrekson (2002), following the government’s major influence in the Swedish system, institutions are given little freedom to use wages as means of rewarding individual employee’s efforts in university research and teaching, and to vary the level of wages for the economic value of the university employee’s area of specialization.

After the recovery of the large public budget deficit due to the economic crises experienced in 1990s, research and growth policy received increased attention in the Swedish policy agenda. Due to a relative slow growth in Sweden and increasing regional economic imbalance the effectiveness of the Swedish innovation system was questioned. As a consequence, several governmental agencies were created to stimulate the Swedish innovation system (OECD, 2002a). Brundenius, Göransson, and Ågren (2008) point out that “Sweden has in a pioneering way developed a specific governmental organization focused on supporting the development of innovation systems” (p. 10). One of these agencies was Vinnova. Its mission among other things was to finance research, develop and demonstrate activities that met the needs of business and the public sector (OECD, 2002a). In 2005 “Innovationsbron” was created, with the ambition to significantly increase the commercialization and exploitation of the resources that Sweden invests in R&D (Innovationsbron, 2011b). The educational system in Sweden is, as in other European countries, the main vehicle for academic entrepreneurialism. But it is also a movement towards getting university researches more directly involved in commercial activities (Brundenius, et al. 2008).

To promote commercialization of research the government has established a set of legal acts. The teachers’ exemption favors the university researcher by granting complete ownership of the research results. Arguments for the exemption are to protect the scientific freedom and to increase the output of university research by minimizing bureaucracy (Sellenthin, 2004). However, some argue that a consequence of the teachers’ exemption is that universities have a few incentives that inspire them to engage in facilitate knowledge transfer to the commercial sector. Due to the inflexible salary system and other limitations in the ability of individual agreements it is difficult for universities to retain attractive staff who has established personal links with business (Henrekson, 2002). Therefore, according to Etzkowitz, Asplund and Norman, (2000) the university's interest has in a matter of fact been to discourage contacts between university researchers.

---

\(^7\) System of innovation (SI) the determinants of innovation processes, all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations. (Edqvist, 2005)
In recent years there has been a growing awareness that universities should play a more active and efficient role in facilitating commercialization and in creating favorable environments for the commercialization. The Swedish government has however not followed the international trend in removing the teachers’ exemption law, rather stressing voluntary agreements and internal policies between the individual researcher and the university to encourage a collective effort in commercializing research (OECD, 2002a). According to Brundenius et al. (2008) a further attempt to stimulate university commercialization as a response to worries regarding economic growth and increased unemployment rates is the legal act from the late 1990s, in which the Swedish system for higher education were given a “third mission”. In addition to universities’ core missions, teaching and research, universities were obliged to increase the interaction with society and economic life. Furthermore, Brundenius et al. (2008) point out that the third mission has received attention in debates and has caused a lot of controversy due to the various interpretation of the task and has been seen as a relatively weak top down introduction for universities to be more involved in society “[...] it can mean anything from educational outreach to better inform the public about academic activities to the establishment of a range of technology transfer mechanisms” (p.11).

3.1.2 Commercialization Activities

3.1.2.1 Patenting and Licensing

Historically, commercial use of university research has been viewed in terms of spillovers (Thursby & Thursby, 2001) but over the past few years universities have been promoting technology commercialization, an increased emphasize which scholars to the changing socio-economic role of universities (Henderson & Trajtenberg, 1995). As an international trend the university-industry research collaboration has recently attracted increased attention due to the growth in both university patenting and the licensing of technologies to private firms, a change which is considered as a direct consequence of the Bayh–Dole Act of 1980 (Mowery, Nelson, Sampat, & Ziedonis, 2001). The expanded licensing and patenting activities among universities in the US has enhanced their contribution to U.S. economic growth, something that has changed the traditional role of university of teaching and research (Mowery at el, 2001). Having this in mind, more knowledge is needed of the university activities regarding inventions, patents, licenses and spin-off companies (Wallmark, 1997).

Both patenting and licensing are forms of IP and are defined in table 1. The impact of an increased reliance on IPR by universities on academic research is difficult to evaluate. This is because the IPRs are such new technology commercialization activities (developed in European universities over the last 10 to 20 years). But, the view on these commercialization activities has changed from being seen as something for managing research agreements, into something for assessing and protecting IP and making it available to the industry (Nesta & Geuna 2003). According to Molas-Gallert, Salter, Patel, Scott and Duran, (2002), both patenting activities and related licensing of these patents are today well-known and widely used. Furthermore, Thursby and Thursby (2001) point out that technology transfer, through licensing, enables returns from faculty research.
Technology licensing agreements have according to several scholars proven to be an effective mechanism for commercialization of innovations produced by universities (Wood, 2011; Thursby & Thursby, 2007). The agreements are often favored for the universities because of the increased speed to market and by minimizing financial risk (Kim & Vonortas, 2006; Zhao, 2004). Literature also identifies other positive impacts for the university exploiting IP such as increased financial resources (Nesta & Geuna, 2003). According to Wood (2011) licensing agreements enable commercialization of innovations to an outside party, in return for payments or a fixed fee. These financial resources could either be allocated to; support a new area of research, develop new opportunities for teaching (both of which according to Nesta and Geuna (2003) are normally difficult to finance from traditional funding); increased contract research funding for further developments into a final product of the IPR; the creation of spin-off companies that are partially owned by the university and faster exploitation of new inventions (Nesta & Geuna 2003). A difficulty with patenting and licensing is that university innovations are seldom fully developed, which can make them difficult to value (Thursby & Thursby, 2007). The fact that technologies in the early stage are hard to value makes deciding upon licensing fees, royalty fees and revenue sharing agreements challenging. The technology transfer is also difficult, without enough faculty involvement (Jensen & Thursby, 2003).

In Sweden, the law gives the researcher the right to receive the entire benefits derived from the IPR, this also implies that it is the researcher who has to bear the costs of the patent application (Wallmark, 1997). Furthermore, Wallmark (1997) points out that the inventor is required to carry out a complete personal screening of his application in advance - which leads to a very high percentage (about 85%) of the applications being granted. Sellenthin (2009) even argues that universities in Sweden have a support infrastructure that has a positive impact of applying for patents. According to Goldfarb and Henrekson (2003), the Swedish government has introduced legislative changes and policies initiative aimed at pushing universities to get more patents out of their research. However, these policies have been ineffective in coating incentives for the researchers to become involved in commercialization, which also makes it problematic for the university to motivate the researchers to commercialize IP.

3.1.2.2 Spin-off

University commercialization activity related to the creation of spin-offs can have a direct and positive effect on entrepreneurship. Entrepreneurship has for long been identified as an important factor for national and regional economic development. It is also according to European Commission (2000) recognized as a vital tool of technology innovation. One major source of entrepreneurial activity is according to Rasmussen et al. (2006) university spin-offs. Bercowitz and Feldmann, (2006) defines a university spin-off as “a new commercial entity that is formed around faculty research or a university license”(table 1). Researchers recognize that spin-offs are the most visible and most commonly commercial outcome of university research (Shane & Stuart, 2002; Bercowitz & Feldmann, 2006). Rasmussen et al. (2006) presents a model (see figure 3.3) of how university spin-off emerge from a simple process (research-based idea or opportunity, one person or a team of entrepreneurs, and the relevant context).
Rasmussen et al. (2006) recognize three main reasons for a university to focus on creating new firms rather than collaborate with existing ones. First, university spin-offs will most often start out as partners who acknowledge the university’s competence, financial situation, and special long-term mission. These companies may as such become essential future contractors. Second, in tough economic periods the creation of new firms could be made easier as collaboration with existing companies can be highly influenced by the existing firm’s economic cycle. Thus, new businesses will receive more public attention and support. The third reason according to Rasmussen et al. (2006) is the visibility of spin-off firms. The establishment of a new firm is more of a visible output of university activity since the impact of collaborative interaction with existing businesses in terms of job creation and the creation of innovative new products has proven to be difficult to measure. Thus, the universities may use this visibility in the struggle for public funding.

However, despite the major advantages of the creation of new firms, university spin-offs are also associated with considerable challenges and may have to overcome substantial barriers to entry markets (Wood, 2011). For example, it requires extensive financial capital and human support (a high level of commitment) – something that makes participation hard to motivate by faculty and inventors (Nicolaou & Birley, 2003). Furthermore, Hoang and Antonic, (2003) argue that university spin-offs frequently lack critical resources such as initial investment capital, marketing, selling and/or managerial skills. However, such resources can be acquired through direct support from business incubations and through other networks (Hoang & Antonic, 2003). Landry et al. (2006) claim that it is evident that some universities are more likely than others to reinforce entrepreneurial activity and to adopt policies designed to support creation of spin-offs e.g. exclusive licensing, creating pre-seed stage capital etc.

### 3.1.3 Human Capital Activities

In the recent decade the need of firms to become knowledge producing organizations, in order to maintain competitive advantage, has encouraged more innovative collaboration approaches between universities and the industrial sector. When considering human capital as a source of commercialization, universities are unique in terms of their potential. Santoro and Chakrabarti (2002) describe universities’ contribution to firms not only as a source for obtaining knowledge and technology, but also as a tool for recruiting employees and consultants. This relationship benefits both industry and university. From the industry’s perspective the firm can make valuable contact with talented students as well as gaining an improved image when collaborating with other well-known academic institutions (Fombrun, 1996). From the perspective of the universities, students are through collaborative activities exposed to practical problems while gaining
access to new technological areas, at the same time as employment opportunities for the students may be created (NSB, 2000). This complementary relationship between universities and firms has in several cases led to advancement in knowledge and the creation of new technologies in many different areas (Santoro & Chakrabarti, 2002; Pisano, 1990; Van Rossum & Cabo, 1995; Frye, 1993). Human Capital activities are defined in table 1.

Furthermore, Wang and Lu (2007) point out that in order to create a successful commercialization and knowledge transfer, universities and firms need to establish strategies of facilitating interactions between the university’s faculties and the firm. One of the suggested strategies includes faculty personal encouraging senior managers from a firm to participate in supervising PhD and master students for their research project etc. This environment creates an interaction between university and the firm where human capital sharing develops a framework of successful commercialization and knowledge transfer.

In Sweden there are a few legal regulations which influence the mobility of researchers. According to OECD (2002a) researchers are free to take appointments in companies; there are no special employment conditions that stop them. Moreover, since researchers’ mobility to industry has not been considered a qualification in the career system of the university researcher, they do not consider mobility as high priority. The universities may finance researchers that work part or full time at a company – while being employed at the university (half of their salary is paid by the government) – so-called “contact researcher”. By letting individuals with professor’s competence (who are employed in a company for example) work part time at the university or employees from the industry take part of postgraduate studies at the university, mobility and collaboration with industry are endorsed (OECD, 2002a).

Table 1 Definitions of Commercialization Activities

<table>
<thead>
<tr>
<th>Commercialization Activities</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patents</td>
<td>Researcher agrees, or takes initiatives, to patent research findings.</td>
</tr>
<tr>
<td>Licenses</td>
<td>Legal Rights to use a specific piece of university intellectual property.</td>
</tr>
<tr>
<td>Spin-Off</td>
<td>A new commercial entity that is formed around faculty research or a university license.</td>
</tr>
<tr>
<td>Shared personnel</td>
<td>Persons employed in academia temporarily work at a company through shared research projects, and vice versa.</td>
</tr>
<tr>
<td>Labor movement</td>
<td>Recruitment of students or other personnel from the university, especially those working on sponsored projects.</td>
</tr>
<tr>
<td>Informal and pre-formal discussions</td>
<td>Informal contacts between key researcher and company research director. Invitations to present research findings in non-academic settings.</td>
</tr>
</tbody>
</table>

3.1.4 University Support Structure

3.1.4.1 Technology Transfer Office

The trend of establishing TTOs started in the USA and the pattern observed in the USA also has become an international phenomenon - the use of TTOs to commercialize academic research is now evident across Europe, Australia, Canada and elsewhere (Siegel, Veugelers & Wright, 2007; Hellström, Jacob, & Wigren). Universities establish TTOs in order to capture and secure a sufficient level of autonomy for developing relations with the industry (Debackere & Veugelers, 2005). Furthermore, the intention with TTOs is also to create an environment where commercialization, the research and teaching activities do not appear as an interest of conflict (Debackere & Veugelers, 2005).

Debackere and Veugelers (2005) describe TTO as an agent which provide supporting services (the most common is management of intellectual property and business development), facilitates relation with a venture capitalists, investors and patent institutions etc. The TTO often functions as an instrument for reducing information problem typically encountered in the scientific knowledge market (Debackere & Veugelers, 2005). The role of the TTO can also be described as an “intermediary between suppliers of innovations (university scientists) and those who can potentially (help to) commercialize them, i.e. firms, entrepreneurs, and venture capitalists. TTOs facilitate commercial knowledge transfers of IP resulting from university research through licensing to existing firms or start-up companies of inventions or other forms” (Siegel, Veugelers & Wright, 2007, pp. 641). Furthermore, Siegel et al. (2007) describe TTO-activities with economic and policy implications, due to the fact that licensing agreements and university-based start-ups may lead to increased revenue for the universities, local economic and technological leftovers through job creation and R&D investment, and job opportunities for researchers at the universities.

Siegel, et.al. (2007), claim that the TTO has an ambivalent goal; to represent the faculty and the university. From the faculty points of view the TTO represent a professional entity which can identify opportunities and develop spin-offs through its commercial networks and business development expertise. From the university point of view the TTO’s role is to establish wide policies regarding the share of licensing income and/or the research (which is sponsored). According to Siegel et al. (2007), the TTO can influence the number of inventions being disclosed, should evaluate the inventions once they are disclosed, and also negotiates licensing agreements with companies as an agent of the administration – something that can be viewed as a ‘balancing act’. Figure 3.4 demonstrates the roles of TTO in relation to a university setting.
3.1.4.2 Science Park and Incubators

The increased attention of Science Parks and Incubators has become an international phenomenon after the breakthrough in USA in the early 1980s. The increased attention is due to the response to developmental and growth economists’ announcements that an increase in the rate of the investment in R&D will allow industrial countries to compete with emerging economies, which generally have significantly lower labor costs (Phan, Siegel & Wright, 2005). Science Parks and Incubators became a common idea when university commercialization was considered, according to Poyago-Theotoky, Beath, and Siegel (2002) many universities in all OECD nations have established Science Parks and Incubators on or near campus. Furthermore, Poyago-Theotoky et al. (2002) point out that Science Parks and Incubators often rely on capital from the state or regional governments, since they are perceived as something promoting economic growth and development.

Science Parks and Incubators with its administrative centers focus on business growth through knowledge agglomeration and resource-sharing. The activity of these property-based institutions has increased recently and has therefore both motivated a debate whether such initiatives really enhance the performance of companies, universities and economic regions, and also started an interest among for example industry leaders to identify best practices. Because of this, important questions are raised related to the strategy formulation by both the organizations that manage these institutions and the people that use its facilities (Phan, et al. 2005). Mian (1996) argues that the establishment of Incubators and Science Parks is a mean to promote new technology-based firms in the region, to provide advice and business support to companies within the region, and to attract new companies to the region. One of the key principles of Science Parks and Incubators is the assessing of academic knowledge and expertise through the on-site location of businesses and also the providing of a catalytic incubator environment for the transformation of ‘pure’ research into production (Mian, 1996; Westhead, 1997).
Furthermore, Mian (1996) acknowledge that “the concept holds out the possibility of linking development of new technology, capital, and know-how to leverage entrepreneurial talent, accelerate the development of new technology-based firms, and speed the commercialization of technology” (p.191).

Furthermore, Sellenthin (2004) points out that Science Parks and Incubators are important for universities because of its unique character, with the establishment of new enterprises and its collaboration with the other public support actors. Furthermore, Sellenthin (2004) adds that the existence of Science Parks and Incubators promote academic spin-offs as well. Phan et al. (2005) also claim that Science Parks and Incubators have become an international phenomenon and that it is one of the ways to measure the success of universities commercialization. For newly created firms, Science Parks and Incubators are the organizations that provide a social environment, technological and organizational resources together with expertise of turning a technological idea into a well-functioning economic organization (Phan et al. 2005).

However, Löfsten and Lindelöf (2002) claim that the level of interaction between local universities and firms located in Science Park is in general low and it is debated whether or not these kinds of organizations are effective. Nonetheless, there is an interest among policymakers and industry leaders in identifying benchmarks for development, which has led to an increased focus on the strategy formation of the management of Science Parks and Incubators. However, these initiatives are often results of public-private partnership, which means that several stakeholders have influence over the missions and the procedures. As a consequence, it is complicated to evaluate the effectiveness of the Science Parks and Incubators, as the objectives and missions of the different stakeholders may differ considerably (Phan et al. 2005; Löfsten & Lindelöf, 2002).

3.1.4.3 Holding company

Jacob, Lundqvist and Hellmark (2003) define a holding company as “attached to the universities and provide a mechanism through which the universities can conduct various activities such as owning and sell intellectual property, taking equity of spin-offs, etc.” (p. 1558). The holding companies are designed to pull in research income for a university whereby they are directly charged with the responsibility of providing the support and funding for commercialization of knowledge (Jacob et al. 2003). Sellenthin (2004) points out that holding companies have several functions when considering support to universities’ commercialization. Holding companies are considered as advisors to researchers regarding patenting as well as supporters of the establishment of new enterprises.

In 1994 universities and university colleges were, by the Swedish government, given the right to start holding companies with the aim of buying and selling shares in project and service companies related to R&D (Sojde, Eriksson, Groth, Nordfors, Norgren, Nylander, & Persson, 2003). This right was later extended to include companies which arranged commissioned education. Today, 14 universities have established holding companies, which have been developed differently mostly depending on the characteristics of the local business environment.
The Swedish model for public research, with universities as major providers, demands an increased active interaction with the community of the university itself. According to Nygårds and Blomgren (2006), the holding company is playing an increasingly important role as a tool for academic institutions to address these issues, but also to facilitate the commercialization process. However, according to Jacob et al. (2003), the holding companies are often under resourced both in terms of funding and competency, and many of them are either dependent on government foundations or generally ineffective. A survey made by Riksrevisionsverket in 2001 also questioned the effectiveness of the holding company, the result from a large research driven Swedish university showed that 10% of university researchers did not consider the holding company as particularly successful, and 80% were either not familiar with the existence of the holding company or perceived that the holding company was not successful enough in promoting their support (Braunerhjelm, Svensson & Westin, 2003). Brundenius et al. (2008) acknowledge that Swedish research institutions per se have enough funds to support the incentives for commercialization however, the main obstacle in the system seems to be the holding companies’ lack of financial resources, the lack of resources and competence as well as a negative attitude toward commercialization of research results among these organizations. Moreover, Sellenthin (2004) points out that only when the university holding company can offer favorable conditions to the researchers their involvement is considered as an option otherwise the public infrastructure is neglected.

3.2 Research Questions

The problems around the Swedish paradox discussed in section 1.1 were something that brought the author’s attention during the planning stage. The stated purpose will be answered through focusing on the following questions;

**Question 1:** What kind of commercialization activities does the university undertake in order to commercialize research results?

**Question 2:** How could the university’s commercialization support structure be described?

---

8 Riksrevisionsverket is one of the bodies charged with exercising the powers of scrutiny vested in the Swedish Parliament. The task is to audit state administration so as to contribute to the economic use of resources, and to effective and efficient administration. (Riksrevisionsverket, 2011)
4 Methodology

The following chapter refers to techniques used to obtain and analyze data. This part outlines the approach used in order to fulfill the purpose of this study. There is an argumentation around chosen research method, and data collection techniques throughout the chapter.

4.1 Research philosophy

The way one view the world affects the choice of research philosophy and will support the research strategy and the method part of that strategy (Saunders, Lewis & Thornhill, 2009). When the purpose of a research paper aims to answer a specific problem it is nonetheless, developing new knowledge and different studies may generate different types of knowledge. The research questions needs to be recognized for the fulfillment of the purpose, which can help to identify what knowledge to be generated in the study. It is the generated knowledge that must be able to answer the research questions (Goldkuhl, 1998). Saunders et al, (2009) claim that there are different research philosophies about the research process of how knowledge could or should be generated. Two major research philosophies are presented in the literature, the schools of positivism and hermeneutics, but Widerberg (2002) also believes that a third view should be taken into account, realism. These three views exist on their own but may be overlapping each other.

The purpose of this thesis is to explore how Swedish universities’ commercialization activities and support structure influence the Swedish paradox. For this purpose, the approach of the study was not from a positivistic perspective, as the authors did not believe there was one truth or absolute reality to be discovered, which according to Saunders et al. (2009) is representative for the positivistic perspective. The authors of this thesis argue that commercialization activities and support structure are the universities construct and the success or failure of these depends upon the perspective of the universities. For this reason the authors claim that this study is more of a hermeneutic approach, which is a general methodology for interpretation. The hermeneutic research is viewed upon as a method connected to a qualitative research method. Three expressions make up the hermeneutic process, preconception, understanding and an explanation of the phenomena (Gummesson, 2003). This thesis is more likely to be hermeneutics since there are multiple realities to be understood (how different universities commercialize its research). The different realities which can be understood in this context are related to the subjective interpretation of the investigated area. The definition of commercialization may differ among universities but also among individuals within a university, which means that the phenomenon can be interpreted and conveyed in different ways. The aim is leverage a picture of how a particular group (the respondents) perceive the reality of the investigated area. According to Hartman (2001), the goal of hermeneutic is to formulate a theory that convey an understanding of how people in a certain group perceive reality rather than to formulate hypotheses which specify measurable characteristics between properties in the world.

The first goal of this thesis is to see which activities the universities undertake in order to commercialize their research, the second is to look at the universities’ support structure and analyze how these two topics may influence the Swedish paradox. The research philosophy and the nature of the purpose led the authors to do an exploratory research. Data collection, empirical finding and analysis will be guided primarily by an inductive
perspective, whereby the collection, examination and process of continual re-
examination of data will determine the research findings (Saunders et al, 2009).

4.2 Research approach
Easterby-Smith, Thorpe, and Jackson (2008) suggest three reasons for why it is im-
portant to make decisions about the research approach. First, it enables the researcher to
take a more informed decision about the research design; second, it will help the re-
searcher to think about those research strategies and choices that will work and, those
that will not, and third, knowledge of the different research traditions enables the re-
searcher to adopt the research design to cater for constraints. Furthermore, when deci-
ding about research approach it is important to describe the different approaches and ex-
plain why a certain method was chosen. According to Saunders et al. (2009) one of the
most important questions concerning the design of a research project is whether the re-
search should use a deductive or inductive approach. In the deductive approach a theo-
retical proposition comes first followed by empirical data. This means that assumptions
can be made out from existing theories and tested with the empirical data. In the inductive
approach, the empirical data is the starting point and after the empirical data have
been collected, a theory will be developed as a result of the data collection.

The authors of this study aimed to understand the nature of the investigated phenome-
on and according to Saunders et al. (2009) an inductive approach is most appropriate
when a researcher want to get a feeling of what is going on, and better understand the
nature of the problem. Furthermore, Saunders et al. (2009) claim that the inductive re-
search approach emphasize;

- The collection of qualitative data,
- A more flexible structure to permit changes of research emphasizes as the re-
  search progresses,
- Less concern with the need to generalize

However, it is possible to combine induction and deduction, and it is often advanta-
geous to do so (Saunders, et al. 2009). The authors of this study first undertook a review
of literature in order to identify relevant concepts for the frame of reference, this pro-
gress points towards an deductive approach which explains the combination of the de-
duction and induction in this thesis.

4.3 Research Design
The research design refers to “the general plan of how the research will go about an-
swering the research question(s)” (Saunders et al., 2009, p.136). The initial phase of
this study started with a review of the literature for identification of relevant concepts.
These were structured in the frame of reference in order to make it easy for the reader to
understand the concepts related to the research topic. The first section demonstrates a
generic model that reflects relevant concepts around university commercialization. The
commercialization model encapsulates four major categories; national institutional con-
text, university, commercialization activities, and support structure.
From the model the authors developed the frame of reference which was structure around three topics, national institutional context, commercialization activities, and University support structure.

The choice of an inductive approach and the purpose of the thesis led the authors to do an exploratory study since the authors wished to clarify an understanding of a phenomenon and to gain broader insight into the subject under investigation. The decision about the research design depends on the research question. The way the research question is asked, will result in either descriptive, explanatory or exploratory answers (Saunders et al., 2009). The research question of this thesis is using the ‘how’ in its formulation, something that further supports the choice of using exploratory research. According to Robson (2002 p. 59) an exploratory study is a valuable mean of finding out “what is happening to seek new insights; to ask questions and to assess phenomena in a new light”, and it is particularly useful if you wish to clarify your understanding of a phenomenon.

The preferred method when examining questions of “how” and “why” in current events and where the behaviors within the event cannot be manipulated is to conduct a case-study (Yin, 2003). The viewpoint of the authors of this thesis is that the condition in which this study is conducted is an example of what is described by Yin (2003), hence a case study method was most suitable. In this study, the strategy chosen to answer the research questions was cross-sectional multiple case studies. Cross-sectional study is used when one wish to study a particular phenomenon at a particular time, this time horizon is often utilized in a qualitative method when case studies are based on interviews conducted over a short period of time (Saunders et al., 2009).

The research design refers to the way in which you choose to combine quantitative and qualitative techniques and procedures. The research design of this study was of qualitative nature. A qualitative research design is according to Saunders et al. (2009) used predominantly as a synonym for any collection technique for example interviews or data analysis procedures such as categorizing data that generates or use non-numerical data. In this thesis, both primary and secondary data was used to answer the research purpose. The authors used a multi-method qualitative study, which refers to the use of more than one data collection technique and corresponding analysis procedures (Saunders et al., 2009). According to Wrenn and Stevens (2001), two of the most typically used strategies for exploratory research are case analysis and personal interviews, which further supports the strategy choices. The data collection technique used in this thesis to gather primary data was semi-structured interviews as these data are likely to reveal and understand the ‘what’ and the ‘how’, but also emphasis the ‘why’ (Saunders et al., 2009). The respondents are key personnel at each university with knowledge in the investigated area. To gather secondary data the authors used documentary written materials, such as university websites, reports and memos.

4.3.1 Qualitative research

Maxwell (2008) claims that a qualitative study is appropriate when the researchers want to understand a particular phenomenon, which in this study is the context in which commercialization is conducted and how universities may influence the Swedish paradox. Furthermore, Maxwell (2008) points out that qualitative research is more suitable when the study typically involve collecting data from a small sample rather than from a large sample. Thus, the small sample gives the researchers the possibility to understand the phenomenon shaped by the unique circumstances in which these occur. In this study
the sample was relatively small and consisted of 17 respondents from four different universities in Sweden.

The main differences between qualitative and quantitative research can be summarized as; quantitative data is based on meanings derived from numbers, collection results in numerical and standardized data where analysis is conducted through the use of diagram and statistics, while qualitative data is based on meanings expressed through words, collection results in non-standardized data requiring classification into categories and analyzed through the use of conceptualization (Saunders et al., 2009). Furthermore, to draw distinctions between qualitative and quantitative research is helpful in terms of understanding what is necessary in order to be able to analyze these data meaningfully (Saunders et al., 2009).

4.3.2 Case Study

The choice of doing an exploratory study, in which the aim is to seek new insights and to understand a particular phenomenon, a case study approach was considered as most appropriate. According to Yin (1994) a case study is particular applicable when the purpose is to get a deeper understanding of the problem within a limited amount of time. Case research means to use one or many empirical cases in research, especially when knowledge about the area is scarce, none existing or concerns complex phenomena (Gummesson, 2003).

Yin (2003) distinguishes four types of strategies for case study based on two dimensions; single case vs. multiple cases and holistic case vs. embedded case. The chosen case study design in this thesis could be seen as the holistic multiple case design, which means that the researchers treat the organization, in this case each university, as a whole (Saunders et al. 2009). Multiple case studies according to Yin (2003) are more robust than single-case studies and give more vigorous research outcomes.

Figure 4.1 Types of design for case studies (Yin, 2003)

A convenient sample of illustrative cases was selected among Swedish universities. All universities have a technical focus. The investigation is based on data collection from the following four institutions; Halmstad University, Jönköping University, Linnaeus
University, and Lund University. The authors have choose not to include the most prominent technological universities, such as Chalmers and KTH since these are perceived as having well developed and established commercialization systems and have already been popular investigation areas in previous studies. Information about the chosen universities is presented in table 2.

Table 2 University sample  (Based on a manuscript written in Swedish from the universities’ web sites)

<table>
<thead>
<tr>
<th>University</th>
<th>Case Presentation</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halmstad University</td>
<td>Halmstad University is one of the more recently established universities in the country and research and development is a major part of the university’s activities. The university has been successful in developing its range of degree courses and programmers as well as attracting students. The University has 14,500 students and 500 employees, including 40 professors (Halmstad University, 2011d).</td>
<td>Halmstad</td>
</tr>
<tr>
<td>Jönköping University</td>
<td>Jönköping University is one of three Swedish private, non-profit institutions of higher education with the right to award doctorates. The university operates on the basis of an agreement with the Swedish Government and conforms to national degree regulations and quality requirements. Today Jönköping University has 12,000 students and about 800 employees. Jönköping university has an international approach and focus on entrepreneurial activities, renewal in industry and commerce (Jönköping University, 2011b).</td>
<td>Jönköping</td>
</tr>
<tr>
<td>Linnaeus University</td>
<td>Linnaeus University pursues teaching and research in Kalmar and Växjö. The university has 35,000 students and 2,000 employees. Linnaeus University recently established a special office for innovation in order to stimulate and support the commercial exploitation of research and more specifically innovations within the service sector and in sectors which are strongly represented in the region (Linnaeus University, 2011b)</td>
<td>Växjö</td>
</tr>
<tr>
<td>Lund University</td>
<td>Lund university is today one of the largest, oldest and broadest universities in Scandinavia and is consistently ranked among the world’s top 100 universities. Research is conducted in all technological areas. Lund University is within, nanotechnology, combustion physics, and biotechnology the world leader. Around 46 000 students are studying at the university, which also employs around 6000 (Lund University, 2011b).</td>
<td>Lund</td>
</tr>
</tbody>
</table>

From the viewpoint of the authors, by exploring universities with a difference in size, structure and maturity provided the researchers with a good foundation for the analysis. The relatively small sample, used in this study, is motivated as a small sample is preferable in a qualitative research.

4.3.3  Interviews

Interviews can help to gain valid and reliable data that are relevant for the research questions and objectives (Saunders et al. 2009). In this study e-mail, telephone and face-to-face interviews were conducted. The interviews were completed by follow-up telephone questions when the authors wished for complementary information and to avoid misinterpretations. The follow-up interviews also gave the authors the opportunity to
gain new information encountered in relation to the research topic. Information about the respondents is presented in table 3.

Table 3 Interview participants

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Position</th>
<th>Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jönköping University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respondent A</td>
<td>Business Developer, Science Park</td>
<td>Face-to-face, Telephone interview</td>
</tr>
<tr>
<td>Respondent B</td>
<td>Professor Emeritus of Industrial Marketing, Senior Advisor.</td>
<td>Face-to-face interview</td>
</tr>
<tr>
<td>Respondent C</td>
<td>CEO, Länsteknikcentrum</td>
<td>Face-to-face interview</td>
</tr>
<tr>
<td>Respondent D</td>
<td>Expert in Trade and Industry, Regional Development Council</td>
<td>Face-to-face interview</td>
</tr>
<tr>
<td>Respondent E</td>
<td>Business Developer, Science Park</td>
<td>Telephone interview</td>
</tr>
<tr>
<td>Respondent F *</td>
<td>Head of Research and Research doctoral program, School of Engineering</td>
<td>Telephone interview</td>
</tr>
<tr>
<td>Respondent G *</td>
<td>Lecture; Computer technology, Programme manager- Computer and electrical engineering, School of Engineering</td>
<td>E-mail interview</td>
</tr>
<tr>
<td>Halmstad University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respondent A</td>
<td>Innovation coordinator, CEO Holding Company (HHUAB), Business Coach, Manager of pre-incubator, Science Park</td>
<td>E-mail interview, Telephone interview</td>
</tr>
<tr>
<td>Respondent B</td>
<td>Higher Education Council</td>
<td>E-mail interview, Telephone interview</td>
</tr>
<tr>
<td>Respondent C *</td>
<td>Unit manager, Department of external relations</td>
<td>Telephone interview</td>
</tr>
<tr>
<td>Respondent D *</td>
<td>Professor in Industrial Organization</td>
<td>E-mail interview</td>
</tr>
<tr>
<td>Linnaeus University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respondent A</td>
<td>Innovation advisor, Department of external relations</td>
<td>E-mail interview</td>
</tr>
<tr>
<td>Respondent B</td>
<td>Innovation advisor, Department of external relations, Project Manager</td>
<td>E-mail interview</td>
</tr>
<tr>
<td>Respondent C</td>
<td>Head of the department of external relations</td>
<td>Telephone interview</td>
</tr>
<tr>
<td>Lund University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respondent A</td>
<td>Business Development Manager, LU Innovation</td>
<td>E-mail interview</td>
</tr>
<tr>
<td>Respondent B *</td>
<td>Professor, Associate Professor</td>
<td>E-mail interview</td>
</tr>
<tr>
<td>Respondent C</td>
<td>Marketing Manager, Science Park Ideon</td>
<td>Telephone interview</td>
</tr>
</tbody>
</table>

* Few of the respondents requested to remain anonymous, whereby the authors decided not to present the names of any of the respondents. Moreover, Jönköping University has more respondents than the other universities, since the authors conducted a few interviews in this case in a planning stage of the study, in order to gain a general understanding about commercialization. These interviews were later found contributing to the chosen topic of study.

* indicates respondents who were considered to possess relevant information, but could not give us valuable information related to the research. However, these respondents are still considered to be valuable for this study (see chapter 7)
Due to the geographic disperse of some respondents, the authors decided that e-mail and telephone interviews were the most suitable strategy, something that Morgon and Symon (2004) argue is particularly useful in this kind of situation. Furthermore, Morgon and Symon (2004) point out that e-mail interviews can be used to overcome problems associated with audio-recording and transcription. The disadvantages with e-mail and telephone interview are that the interviewers miss spontaneous reactions and body language of the respondents, which can be important for the study. E-mail interviews also give the respondents the opportunity to prepare themselves, which can be considered as either positive or negative.

According to Saunders et al. (2009) semi-structure interviews, in an exploratory study, can be very helpful to “find out what is happening [and] to seek new insight” (Robson, 2002, p. 59). Furthermore, the data revealed from semi-structured interviews provide the researchers with an understanding of ‘what’ and ‘how’ but also to place emphasis on exploring the ‘why’ (Saunders et al., 2009). As this is in line with the purpose of this paper, a semi-structured interview was designed. A semi-structured interview is conducted according to a prepared list of themes and questions and the interviewee is free to adopt the questions to each respondent (Saunders et al., 2009). The interview questions were designed in relation to the purpose and contained exclusively open questions (Interviews outline is presented in appendix 1). Open questions are used when the researcher wants to obtain the views and experiences of the interviewees (Saunders et al., 2009).

4.3.4 Material analysis

One type of qualitative analysis process is categorizing data. Saunders et al. (2009) point out that categorizing data consists of two techniques, developing categories and then attaching these categories to meaningful ‘chunks of data’. Miles and Huberman (1994) point out that qualitative data require some processing since these data are not directly accessible for analysis.

In this thesis the authors used an inductive approach, which means that an inductive perspective on the analysis is most appropriate. The analysis procedure used in this thesis was an interactive model presented by Miles and Huberman (1994). This ‘inductively based analytical procedure’ is based on the process of doing analysis, which consists of three activities; data reduction, data display, and conclusion drawing/verification (see figure 4.2). The data analysis interactive model was used in this thesis to identify key issues in the empirical data derived from the data collection. This strategy was appropriate because the model gave the authors the opportunity to generate an easy display of the data which could be progressively developed. The data display facilitated the interpretation of the data derived from the data collection.
The interactive model outlined by Miles and Huberman (1994) illustrates an ‘interactive, cyclical process’. During the data collection phase the researchers progressively moved between these four activities. In the analysis phase the progress limited the researcher to reduction, display, and conclusion drawing/verification.

Data reduction according to Miles and Huberman (1994) is “the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions.” (p. 12). The data reduction process may occur even before the data is collected as the researcher already has made decisions on which frame of references, which research questions and which data collection techniques to use. In this study the authors structured the frame of reference with relevant core concepts which were related to the research topic and considered necessary to answer the purpose. At this stage the authors had already done an initial data reduction which affected the study since the empirical data collection and analysis was guided by the data reduction.

The data display describes the process where researchers organize and compile the information that enables the researcher to draw meaningful conclusions. The conclusion and verification is when the researchers identify patterns and relationship in the data (Miles & Huberman, 1994). The compilation of the material in this thesis was guided by the structure of the frame of reference. This structure was used in order to make it easy and understandable for the reader. The categorization also leveraged a good representation of what was investigated.

4.3.5 Quality assessment of the thesis

The method chosen for the collection of data should always be criticized through the awareness of the insufficiencies of the thesis (Bell, 2006). To ensure the credibility of research finding, two concepts in particular need to be considered, validity and reliability. Reliability refers to the degree of consistency with which instances are assigned to the same category by different observes or by the same observe on different occasions (Hammersley, 1992). The term validity means the truth, and is interpreted as the extent to which an account accurately represents the social phenomena to which it refers (Hammersley, 1990). The data collection techniques are designed to achieve as high validity as possible; the authors designed the interview questions in relation to the research topic and its purpose. In order to increase the reliability of the study emphasis was placed on having high transparency in how the raw data was analyzed. The interviews were conducted with key personnel at the university. Shortly after the respondent’s in-
terview was received, a complementary phone interview was made in cases when necessary in order to avoid misinterpretation, to increase the validity of the thesis, and also to get a deeper insight on certain areas of interest. All data and information was compiled and interpreted in the fastest possible way while memory was still fresh to enhance reliability. However, because of the fact that a semi-structured interview is less standardized, the reliability of such a study may be affected. The interviewer bias is closely related to this problem; the respondent may present their university as good as possible (even if it is not) – or a partial ‘picture’ of the situation which affects the description of the university in a either positive or negative fashion. The value of this information may raise doubts about its validity and reliability (Saunders et al, 2009). In order to avoid this bias, the authors conducted several interviews at each university and used secondary data such as university reports and web sites as complementary material.

4.3.5.1 Generalizability

The term generalizability defines how the conducted study reflects the reality (Lundahl & Skärvad, 1999). Saunders et al (2009) claims that in a qualitative study using semi-structure interviews, statistical generalization about the entire population cannot be done. In this study the authors have used the method of case studies; although the authors are aware of that there will be problem to generalize the study based on a few events, but it will nevertheless increase the possibility to generalize compared to using one single event (Yin, 2003). However, according to Punch (2005) a study does not always need to be generalized, in relation to this idea, the purpose of this study is to gain an understanding of the complexity and the entirety, in its context rather than to generalize.
5 Empirical Findings

This chapter provides a presentation of the empirical findings derived from the interviews conducted in the four case studies.

5.1 Halmstad University

The information from Halmstad University is based on the interviews presented in table 3, and information available on the university website.

The university considers commercialization in terms of utilization, which according to respondent A can be achieved through new companies, but is more common in existing organizations both in the business world and the public sector. The motivation for the university to undertake commercialization activities is that the university sees it as part of the brand building, the recruitment of students and as being a regional force of growth. Furthermore, respondent B claims that it is important for the university to commercialize research result and that it is important to expose entrepreneurial activities to the students. In order to create this environment the university has created ‘Studentinspiration’\(^\text{10}\) which is financed by the university. In the university’s vision commercialization is a high priority and the focus is on student entrepreneurship. Respondent B points out that the university is in the top regarding student entrepreneurship. In relation to the university philosophy (vision, mission, etc.) the university has three main areas of expertise and themes. One of the themes is innovation – which according to respondent A should be noticeable all through the university, and concerns the role of commercialization. University innovation system, commercialization and collaboration with industry and society are integrated and include both research and education. Most of all research and training are carried out in collaboration with business, community and voluntary associations (Halmstad university, 2008b).

The strengths and weaknesses which are identified in the university commercialization activities and support structure are “the strength is that it is a tradition around new business creation, collaboration skills, increased amount of research, and the weakness is that the university is relatively small” (respondent A). The tradition around commercialization is also mentioned several times as a strength of the university during the interview with respondent B. In order to improve the university’s commercialization performance, respondent A stresses that it is essential to have a high input of new, exiting ideas. The university prioritizes their commercialization activities in following order: start-ups as highest prioritized, patenting, followed by licensing, and sponsored research. In order to measure performance the university use key indicators from the Science Park but the university does not have any specific goals set in relation to commercialization results. According to respondent A “more simple systems and clear roles” would inspire universities to participate more vigorously in commercialization of research.

\(^{10}\)Student Inspiration is a program which supports student ideas into projects or companies.
5.1.1 Commercialization Activities

The university does not currently have any written statutes, regulations, policies or procedures dealing with IP. Respondent A claims that he does not know how many patents the university has sought and obtained annually over a period of five years or how many of these have been licensed to industry, though “a future investigation is planned”. The university has not licensed technology to any company (apart from spin off companies) and respondent A claims that the university does not have any interest/motive for granting licenses. The priority of commercialization of IP with senior university leadership is considered to be low to average. Respondent B discusses the impact of the teachers’ exemption and points out that the law is not a problem; “The teachers’ exemption per se is no barrier to commercialization, and no obstacle for universities to benefit from what the university produces. We have talked to Gothenburg about possibilities with agreement between researchers and university”.

At Halmstad University spin-offs is the prioritized commercialization activity. Respondent A claims that the university has created spin-off companies over the last 5 years. However, an active encouragement of the creation of spin-offs is not a main goal of the university. Respondent B points out that the university has a strong focus on student entrepreneurship and that it is important to expose the students to entrepreneurial activities. “Many new companies have been formed by the University, not least in recent years, and this will continue. It is therefore important that we can make such a strong investment. Innovation is a profile that is important to us at the University, and it is important that Science Park Halmstad becomes an important part of our innovation” (Halmstad University, 2008a, based on a manuscript written in Swedish).

The university has programs to establish and maintain linkage between industry and the university to promote commercialization of research outcomes. Hälsoteknikcentrum is mentioned as an obvious link, and also that the university has “a tradition of product and service development research projects conducted by students in industries”. This linkage is considered as vital in the university’s commercialization strategy. The university has a special unit in charge of the collaboration that takes place beyond what is normally handled by the academic units. The unit also works to stimulate and support the academic units’ collaboration with the surrounding world. The university will, together with Innovationsbron in Lund and Gothenburg, allow the special unit resources to stimulate researchers to commercialize their research findings. Together with the municipality, the university has further developed the innovation system, which now includes inspirer, education, pre-incubator, incubator, Science Park, counseling, holding company and industry cluster building (Halmstad university, 2008b).

5.1.2 University Support Structure

The university has a support system which includes activities such as student inspiration, guidance and scholarships, to help to develop ideas and start businesses. The first step in the innovation support system is the pre-incubator, which links the period of study at the university together with Science Park Halmstad. Respondent B claims that the pre-incubator allows students to access business hotels in an early stage. “The university finances the pre-incubator, which is located in Science Park”. The second step in Science Park Halmstad is an incubator which purpose is to support companies formed in the pre-incubator or has come into the business in another way. Science Park

---

11 a joint platform for the pursuit of development in the area of health technology (Halmstad University, 2011e).
Halmstad AB also includes a business park. The university’s holding company, HHUAB\textsuperscript{12} provides venture capital and competence early in the innovation process (see figure 5.1).

![Figure 5.1 Halmstad University innovation support system, based on a manuscript written in Swedish](Halmstad University, 2010c)

The Holding Company has a portfolio of around 10 companies to assist in commercialization. Respondent A claims that the holding company makes 2-3 investments per year and that “it is important for the environment but more resources would be good”. According to respondent B “the holding company is active in seed capital and they are directly investing in early stages of spin-offs (mostly student spin-offs)”. HHUAB started in 2008 a subsidiary, Halmstad University’s Investment AB (HHIAB\textsuperscript{13}).

Today the university does not have a commercialization office, but they have future plans for it (respondent A). In order to improve the university’s support of commercialization, the university is currently building a small knowledge transfer office (KTO) and are also in close connection with Innovation Office West\textsuperscript{14} (Innovationskontor Väst), which is about to start up. The university has a unit for contact and interaction, which interacts with the community, and is directly managed by the dean of the university (respondent B). The university has an innovation advisor and contact persons in different research environments to discuss with researchers (respondent A).

\textsuperscript{12}HHUAB is a wholly state-owned company and will actively contribute to the development of Halmstad University's development into a leading innovative university and a known actor for academic entrepreneurship (HHUAB- Halmstad University, 2011f).

\textsuperscript{13}HHIAB will enhance the opportunities for early stage investments in young innovation-driven companies, rooted in ideas from university students or staff. Today HHIAB has around ten companies in the portfolio.(HHUAB/HHIAB, Halmstad University, 2011g)

\textsuperscript{14}Innovation Office West provides qualifies support, in matters regarding commercialization of research results, including patenting and licensing, knowledge transfer and principle research. The innovation Office collaborates with eight Swedish universities (Innovationskontor Väst, 2010)
The mechanism or procedures used by the university to identify research with commercial potential “involves ‘idea hunters’ in different research environments through innovation advisors” (respondent A).

Respondent B claims that it is important that all stakeholders in the commercialization process are working together and that communication is vital. It is important that each actor knows their roles, but the roles must be overlapping “as a university it is vital that one should be engaged in the model”. Today there are clear roles between the stakeholders in the commercialization process, “in our system each stakeholder knows the roles and it is important to have a close working relationship and clear roles”.

According to respondent B the basic model of the university is supporting the students, and the commercialization result is perceived as positive in the sense “that it is good that the university has it and that we benefit from it”. The university does not have experience of support system that captures research results, “it is not our forte and we do not have the right kind of knowledge”. Moreover, the university has some theoretical models of development of the existing model. Areas that will be developed are:

- Give leading teachers the opportunity to be on service and act as “idea hunters” in research environments. The university will call this position “commercial agents” (nyttoagenter).
- In areas where the university has great capacity the university will together with Science Park build collaborative platforms. (respondent B)

The university is also actively contributing to the development of Science Park, as part of the board of Science Park. The university makes proposals on how to develop parts of the Science Park that the university is responsible for. It is in the interest of the university that the Science Park becomes a stronger player in the whole region and thus be beneficial for both the region and the university (respondent B).

Respondent B points out that if a researcher wants to commercialize the research result through the university, the idea is not that he/she should go to Science Park directly but through the commercial agent. The role of the commercial agent is to have an early stage contact and encourage researchers to commercialize. The commercial agent ought to help and direct the researcher for how to progress in commercializing the research results. In the case of spin-offs, the university has not much experience of researchers as entrepreneurs, but it is quite common that the researchers create spin-offs through collaboration with other students. If researchers wish to patent ideas they can through the Science Park get in contact with external investors, “I believe that there will be more successful business if you combine business people with technical expertise”.

According to respondent B, Jönköping and Skövde are two universities that are prominent in ‘Hyping’ their Science Park. But, if one is taking into account the output and the growth of the spin-offs, Jönköping and Skövde is more consider as “regional developers”.

34
5.2 Jönköping University

The information from Jönköping University is based on the interviews presented in table 3, university reports and articles provided by respondents, and information available on the university website.

The university considers commercialization as starting business (respondent B). From the Science Park’s perspective commercialization is seen in terms of utilization (nyttiggörande) which in respondents A points of view means that “the research can be known through dissertations and licensing”.

Respondent B claims that the university statement in relation to its philosophy regarding the role of commercialization, is toward student entrepreneurship – a strong focus of the university - “we want to encourage students to start a business during the collage days, and we believe that we are successful with this. In 1996 (which is the last point of measure) Jönköping University reached the national average in terms of business start-ups” (respondent B). This is supported by respondent E who points out that the university emphasizes student spin-offs. For the university it is more important to focus on the entrepreneur and on the individual rather than on commercialization per se (respondent B).

The university also believes that it is essential to include the task of supporting sideline activities in the policy documents, something that not all universities have done (and Jönköping University is especially proud of according to respondent B). Respondent A points out the university statement in relation to its philosophy concerning the role of commercialization, “Science Park has an overall responsibility to the university and if one wants help (students or researcher) they should contact Science Park” The university has outsourced the entire function to the Science Park.

According to respondent B the university does not consider the undertaking of commercialization activities as highest priority but still treats it as an important issue. Conducting commercialization or utilization activities makes it easier for the university to get research funding through the “visibility“. It is also important in the competition with other universities. Respondent B points out that ”the university has no interest in engaging in commercial activities because it is the choice of the individual, but of course we use it in marketing”. A few years ago Vinnova issued a national contest in developing internationally competitive research and innovation systems. “During this period, the university was very engaged but we noticed that when the contest was closed down the great venture kind of followed the same path” (respondent D).

When considering the university prioritizing commercialization activities the respondent claim “nobody makes money on patenting. The margin is too small, we are investing much more on utilization” (respondent A). Furthermore, the university does not have any goals set in relation to commercialization results, “the university receives information on how many firms are set up by both researchers and students. One goal is that students start their own business while studying”.

The greatest barriers for a university, related to commercialization, are according respondent A that there is no clear incentive structure and that the university is depended on the funding and may need incentives for companies for the commitment in research. However, “there are problems in this, because all of the research should not be linked to companies, basic research is important but one must also invest in applied re-
search.” (respondent A). Respondent C claims that Jönköping University invests much more in basic research\(^ {15}\) than in applied research\(^ {16}\), which according the respondent implies that the research conducted at the university is not always appropriate or suitable for industry. “One problem is that the incentive system in Sweden is not favorable enough to encourage applied research” (respondent C). Respondent A points out that those who fund research must take responsibility to invest in both basic and applied research.

In order to overcome these obstacles respondent A claims that “the government has a challenge ahead to set the ground rules for the Universities. Schools will be working more with commercialization if there is a game plan. The University must know that this is an important issue, and that one has a broad responsibility to both educate and to convey results...etc.”.

Respondent B believes that the ‘teachers’ exemption’ has an effect on commercialization, in that sense that there is more focus on start-ups than on patents since neither the researcher nor the university have enough muscles to manage the patent procedure and costs. When considering agreements between researchers and universities to facilitate commercialization respondent B sees no value or chance in this, "the university has no interest in co-ownership of patents because it is too costly. The universities are not allowed to use money for loss of driving activity. Negotiating agreement has never been an issue. Since it is not the core activity of the university, there is nothing that we are good at. However, if one remove the teachers’ exemption I believe it is important to find ways to take ownership interests in, professionally”.

### 5.2.1 Commercialization Activities

Respondent A does not know if the university has any written statutes, regulations, policies or procedures dealing with IP, but refers to the teachers’ exception law. Furthermore, the respondent does not have any clue about how many patents the university has sought and obtained annually over a period of five years or about how many of these have been licensed to industry, “not a clue. It is an in-house issue, but I wonder if anyone knows?”. The priority of patenting and licensing with senior university leadership is “average, the university is not directly searching for IPs”. The university does not have any interest in granting licenses and is not so sure if the university even wants to own IP, “no real reason for it. The university has no interest in partnership of patents since it is too expensive.” (respondent B). Though, the respondent points out that there should be a model for licensing.

Respondent A claims that the university is particularly encouraging spin-offs because of the entrepreneurial focus of the university. “The structure around the encouragement might however be improved”. There have been spin-offs created from the university over the last 5 years but the respondent does not know the exact number, "a couple of consulting firms each year and a few product companies from time to time. i.e. RIO Metall,”. Respondent B claims that the university created around 83 companies last

---

\(^ {15}\) “Basic research is defined as systematic study directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind” (National science foundation, 2011).

\(^ {16}\) “Applied research is defined as systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met” (National science foundation, 2011).
year, through the Business Lab. However, respondent B points out that the university does not do anything in particular to encourage the creation of spin-offs more than exposing the possibilities. “I believe that it should not be any kind of brainwashing. Researchers and students who want to do something with their ideas should know how to approach it and we do not have to brainwash them. It is better to expose the possibilities that exist”.

Respondent A points out that the university does not have any goals set in relation to commercialization but a number of measurement indexes which the university obtains from Science Park to measure performance is presented:

1. Number of start-ups by students
2. Number of start-ups by researchers

Collaboration with businesses and surrounding society is one of the guiding stars for activities and strategic development at Jönköping University. The collaborative work can take many forms — through student projects, research collaborations, courses aimed at specific target groups, participation in networks — and it can also be actualized through Science Park Jönköping where the university is a partner (Jönköping University, 2010a).

Respondent B claims that there is currently no personnel exchange between university and industry e.g. PhD that works for a company for a limited time. The respondent believes that this is important and he hopes that this will be developed.

5.2.2 University Support Structure

The university has outsourced all activities related to commercialization to Science Park, since the university believes it is better “that professionals manage this”. The university also find the environment at Science Park more rewarding than what the university will be able to offer. “If a researcher from the university wants to commercialize his/hers research results than they should go through Science Park” (respondent B).

Respondent B points out that “we must have a contact person representing the university and that is something we hope for in the new investment. This person should not give any advice merely act as a contact person. The person should be physically located at Sience Park”. Respondent A also emphasizes the need of a contact person representing the university.

When considering mechanism or procedures by which research with commercial potential can be identified, Science Park is at the university providing information on what Science Park offers. They are also scouting in order to identify inventions with potential. Respondent A points out that “the university is far ahead in terms of marketing the Science Park for their entrepreneurial activities.”. The target group is students, and when considering researchers one must work in a more proactive manner and meet the researchers and discuss their results. More time will be spent on researchers when the new innovation advisor is employed, “this is a resource issue” (respondent A). Respondent B points out that the university themselves does not have any “idea hunter activities” because “it is not necessary, since those who wants to do something with its research must be able to know want to do themselves.”.
The university is closely associated with Science Park, and as co-owners, the university is strongly engaged in the development of Science Park, which provides support for start-ups, development and growth of business ventures. Science Park includes the Business Lab, Business Incubator and Business Growth branches, which support enterprises in their development and in finding funding (Jönköping University, 2011c). Respondent A claims that Science Park provides "direct connection, incubator, collaboration with researchers, incubator companies, help to build companies, financing, equity contribution, loans, etc...National Incubator Programmes". The university’s attitude toward the result obtained from Technology Park and incubators are that it is convenient to move the responsibility on someone else, which is also more cost effective. Respondent B points out that “Science Park is professional and has an effective system”. Respondent A claims that the university is linked to Innovation Office West and that an innovation advisor will be employed. The goal is to meet researchers in order to utilize the research.”Innovation Office West - pretty new ... The innovation advisor will physically sit at the Science Park, but the work will be connected to the university” (respondent A). The university does not have a commercialization office because ”it would be a bit strange if they had one” according to respondent A. The university has a major responsibility through their financing of Science Park. Science Park has an easier time working with students, but they want to work more proactively with the researchers and the respondent hopes for improvement when the new innovation advisor is employed and through the collaboration with Innovation Office West.

The university does not use any holding company; which according to respondent A may be because it is a foundation school. Instead they are co-owners of a local venture capital company that is almost comparable to a holding company. The venture capital company can invest capital in early stages of a project.

Respondent A claims that the strengths of the university commercialization policies and practice are the involvement in Science Park and that the Science Park has a diversified company milieu compared to others (with the incubator, and venture capital firms). Science Park also has an effective support structure. The weakness in the university commercialization policies is that “we could do more when it comes to the researchers; current focus is mainly on the students.”

Respondent A points out that “Science Park has a good support structure for researchers and students who want to commercialize” but enhancing university involvement will improve the university’s support structure. “If the university can see the connection to utilization, in the involvement of companies in our research - it will be easier to give priority to this. The university must know that the innovation process is well embedded in the management. It is obviously not a good thing that there is no contact person at the university, but this will be improved. There is a risk of moving the responsibility to Science Park for example, it must be an issue for the university itself to handle.”. Respondent D supports this and points out that “it is essential to have management and people who are passionate about this and have a personal involvement in it”. Respondent B is questioning a more vigorously involvement of the university in commercialization, “does the university need to become more involved in commercialization? I think we market ourselves enough in terms of student entrepreneurship, but maybe we could improve the marketing towards researchers.”
The respondent also stresses that the university needs to be better at encouraging students in the School of Health Sciences and the Institute of Education to start new businesses.

Respondent B believes that the university could be better at marketing themselves towards researchers, something that is not very prominent today. “We have seen other universities who have achieved success through their efforts towards researchers.”. Respondent A points out that one problem associated with researchers and commercialization is that there may be a conflict of interest in that sense, that some researchers only tend to have their own interest in research and no particular interest in commercializing (innovator or entrepreneur). Respondent B believes that the reason for that there are too few teachers and researchers who are starting companies, is because it affects their research career; “therefore, the only advice we can give to the researchers is to publish, publish, and publish because that is the only thing that will help their careers”.

### 5.3 Linnaeus University

The information from Linnaeus University is based on the interviews presented in table 3, university reports and articles provided by respondent A and information available on the university website.

The university considers commercialization in terms of utilization, which in their point of view is a broader concept than commercialization (respondent A & B). Respondent C points out that it is difficult to define the differences between commercialization and utilization, “all knowledge might for example not be patentable, and everything does not necessary have to be sold for money. It means that you can go into projects which will be win-win situations for several parts. It does not only have to be for earning money”. From respondent A and B’s point of view the university’s motivation for undertaking commercialization activities is “a quality and value indicator for the research conducted at the university”. Commercialization is a very important issue for the university. The university has one out of eight commercialization offices in Sweden and gives high priority to commercialization. It is also important for the region since it generates growth (respondent C).

According to respondent A and B the university does not yet have a statement in relation to its philosophy concerning the role of commercialization. This is under preparation, and will be adapted to each institution in Fyrklövern17, and its internal situation. The vision of the innovation office is formulated as "the Innovation Office is a recognized force for support concerning commercialization/utilization within certain focus areas of research and industries [...]” (Linnaeus University, 2010a).

The university prioritizes their commercialization activities in following order: start-ups, patenting, licensing, and sponsored research. The underlying reason for this priority order is that the university considers start-ups as “a driving force of the regional economy” (respondent A & B). Respondent C stresses that the university is not satisfied with the commercialization performance, in that sense that the flow of ideas is too low, “but we are satisfied that we have a support structure for it”.

17 A joint commercialization office including Karlstad University, Linnaeus University, Mid Sweden University and Örebro University (Linnaeus University, 2010a)
The university uses a number of indexes to measure performance, but the university does not have any goals set in relation to commercialization results (respondent A & B).

1. Numbers of evaluated ideas from employees
2. Numbers of evaluated ideas from students
3. Number who applied for the external funding
4. Number who obtained external funding
5. Number of received external innovation awards
6. Number of sought IPR/Patents
7. Number of granted IPR/Patents
8. Number of ideas submitted to the incubators
9. Number of start-ups (by employees)
10. Number of newly registered sideline activities
11. Number of start-ups (by students)
12. Number of individual articles in the media

In order to improve the university’s support of commercialization competence, improvement of both those who work within innovation consulting and for the researchers are needed. It is also suggested that some kind of incentive structure for example qualification in the subject of commercialization or reduction of working hours in behalf of working with commercialization, is needed to improve the university’s commercialization performance. To inspire universities to participate in commercialization of research results, the respondents stress that the teachers’ exception plays a important role and believes that as long as it exists it is going to be problematic to inspire universities to participate more vigorously (respondent A & B). Respondent C does not believe that the teachers’ exemption affects commercialization remarkably “at least not so much that it needs to be a topic in debates”.

In the view point of respondent C, Karlstad University, Chalmers and Linköping University are prominent in terms of commercialization. The respondent points out that this is because these universities have a strong support from senior management; “it is important that these issues are central, and that there is competent personnel working with this”.

5.3.1 Commercialization Activities

The university does not currently have any written statutes, regulations, policies or procedures dealing with IP. This issue is according to respondent A and B “under preparation of the Innovation Office Fyrklövern, in order to adapt it to each institution’s internal situation”.

The university has not obtained or sought any patents over a period of 5 years, nor has the university licensed technology to any company (apart from spin off companies). The respondents claim that the priority of patenting and licensing with senior university leadership is “probably pretty low”. (respondent A & B) The university’s goal when considering technology commercialization is to increase the number of innovations from research, for example through licensing at Swedish higher education institutions by encouraging and providing professional support to researchers in the commercialization process (Linnaeus University, 2010a).

At Linnaeus University spin-offs is the prioritized commercialization activity. The university has created six spin-off companies over the last five years. Links to each company were provided by respondent A. The university encourages the creation of spin-offs
and carries out activities to make people aware that there is a possibility to benefit from their research. The university gives information about and supports the application of different external fundings. Linnaeus University support student entrepreneurship through the foundation of “Drivhuset”\footnote{The mission of Drivhuset is to create, participate and support activities to encourage students to start businesses (Linnaeus University, 2010a).} (Linnaeus University, 2010a).

The university does not have any program to establish and maintain linkage between industry and the university to promote commercialization of research outcomes (for example exchange of staff between industry and the university; time off for staff to work in industry without loss of seniority; student placement in industry, industry people on university boards of councils) but the university has it in mind “it will be presented in an application of funding from the EU structural funds”. The university has promoted “at least some” informal contacts between university and companies (respondent A & B). Respondent C points out that “we provide opportunities for researchers to work for a company within limited time frames. We also have “researchers checks” (forskarcheckar), which gives companies that see possibilities in co-working with a researcher an opportunity to apply for those checks from the Regional Council to enable researchers to work within a company, it is like buying time”.

### 5.3.2 University Support Structure

The university has an innovation office with key innovation advisers, and also people out at the institutions. The innovation office co-works with organizations such as Vinnova and Almi to gain external fundings. The next link for the university is the link to the incubators and Science Park. “It is really important not to have too many separate parts that work individually. To get all the pieces together are really important and that is something that we are working with” (respondent C). Furthermore the respondent points out that “the commercialization model is under construction, procedures are not quite ready, but we have come so far that we have been sitting down together and agreed to invest in this together, we also hope to get support from the Regional Council”. The clarification of roles between those involved in the commercialization process can be developed, “that is exactly what we are working with at the moment, clarifying the roles. The university is also member of the board of the incubators and is working actively with the development of the Innovation office. Unfortunately the flow of ideas is too low for us to be able to finance our own innovation advisor”.

Karlstad University, Linnaeus University, Mid Sweden University and Örebro University together form a single cohesive innovation office - Fyrklövern (University, 2010a). The innovation office was established a year ago (respondent A & B). The innovation office consists of a network-based collaboration in which the innovation supporting activities are developed jointly through flexible working practices. Fyrklövern’s four nodes share vision, business plan and approach. The four universities see great gains with a clear coordination and a comprehensive exchange of experience, which also brings significant opportunities for cooperation in education and research (Linnaeus University, 2010a). The mission of Fyrklövern is to create growth in Sweden through “making practical use of research through an interaction between the need of the environment, and researchers’ knowledge and interest”. The innovation office is perceived as “something positive” (respondent A & B).
Fyrklövern strengthens its activities by cooperating with other teaching institutions’ innovation support functions and Innovation Offices. The cooperation is partly based on the network SNITTS (Swedish Network for Innovation and Technology Transfer Support), SISP (Swedish Incubators and Science Parks), FUHS (Association of Universities’ Holding companies in Sweden), IBIP (Innovation Bridge’s Business Incubator Program). Cooperation and exchange of experience also takes place through research collaborations between national and international research environments and cooperation on a principal level.

In order to identify inventions with commercial potential the university has innovation advisors and “idea hunters” who seek ideas among the institutions. The respondents point out that “the Innovation Advisors want to work closer to Grant’s office \(^{19}\) in order to get a grip on what is going on” (respondent A & B).

One of the key issues for the innovation office (Fyrklövern) has been to work with attitudes among researchers; “we have been out and met with researchers and presented possibilities”. The university also has a few active researchers out at the research institutions who are acting as innovation advisors. “To be honest I do not really think that academia is ready to work more innovative, if one may generalize, researchers are more used to publish and not doing start-ups for example” (respondent C).

If a researcher wants to commercialize their research results through the university he/she will go through the innovation office. "Our researchers are aware of the innovation office and when a researcher has an idea he/she will contact the staff at the innovation office. They have the first contact and the work will start at the innovation office. The office may in an early stage support with some funding, so the researcher can conceptualize the commercialization process. The researcher can also get support in contacting external financers. The next step can be Science Park for example” (respondent C).

Two of the universities within Fyrklövern (Linnaeus and Karlstad University) are currently owners of holding companies. The long-term strategy is that Fyrklövern should have one joint holding company which can own and manage shares and IPR. Fyrklövern will consider how to utilize the existing holding companies within Fyrklövern and develop models and structures to facilitate commercialization, such as so-called research companies and entrepreneurial match (Linnaeus University, 2010a). The university is, through the holding company owner of Incubator in Kronoberg AB (1/3), and the university considers it as worthwhile (respondent A & B). The actors in the commercialization model at the university are presented in figure 5.2.

---

\(^{19}\) Linnaeus University Grants Office’s mission is to increase the external funding by encouraging more successful applications.
Figure 5.2 Process and Actor map, Commercialization of research findings, Linnaeus University. Based on a manuscript written in Swedish (Linnaeus University, 2010a)

5.4 Lund University

The information from Lund University is based on the interviews presented in table 3, and information available on the university website.

The university does not primarily talk about commercialization, they rather use the term ‘utilization’. From respondent A point of view commercialization is part of utilization, “we are not primarily talking about commercialization, rather about utilization”. The motivation for undertaking commercialization activities is to utilize research in accordance to the mission of the state. In the action plan the university also mentions two other driving forces; growth of the region, and financial gains. At Lund University one considers start-ups and licensing of technology as commercialization. They do not see patenting per se as commercialization. Respondent A mentions that the university prioritizes making research useable for the society and they believe that start-ups and licensing should be given more space. Furthermore, the university is satisfied with the commercialization performance but also see that the university can make improvements in order to increase the performance (respondent A). Respondent C claims that a large part of the start-ups in Science Park are derived from the university, “approximately 70% of the companies came from the university, but it has decreased now, nowadays we have more coming from industry”. The start-ups are represented both by students and researchers.
The university has a statement in relation to its philosophy concerning the role of commercialization; however it is more related to innovation - “the innovation system of Lunds University shall be among the leaders in Europe. The mission is to; in 10 years, create 100 companies, with 1000 employees and 10000 secondary employments” (respondent A).

The university measures performance of commercialization as; number of companies, number of ideas, number of patents, and number of citations. Currently the university has not any goals set in relation to commercialization results. Respondent A claims that the teachers’ exemption is affecting commercialization both in a positive and negative manner, “my assessment is that the positive effects is dominating, i.e. keep the teachers’ exemption”

5.4.1 Commercialization Activities

Lund University does not have any other written statutes, regulations, policies or procedures dealing with IP other than the teachers’ exemption law. Over a period of five years the university has not sought and obtained any patents, due to this law. Nevertheless, they have participated in around 50 patent applications in recent years and at a guess approximately 10 of these are approved today according to respondent A. The university has licensed technology to company (apart from spin-off companies) and the interest/motive for the university’s for granting licenses is to make the university “shine”. When it comes to commercialization, publications are of highest priority since it gives more credit for the university than for example patenting does. However, the status of patenting has increased slightly. In the action plan the university states that licensing has traditionally been a low priority area at Swedish universities, thus Lunds University will work for “supplementing company formation with a sustainable and profitable licensing concept.” In the Action Plan Lund University claims that licensing is common in USA and England but has not been very successful in Sweden. The university considers it necessary as a complement in the commercialization and the solution is probably a close collaboration between universities to minimize costs and maximize knowledge exchange (Lund University a, 2006).

At Lunds University spin-offs and licensing are the prioritized commercialization activities. About 40 spin-offs have been created from the university over the last five years. Company names are available at the university but detailed information about the success of those university-inspired spin-offs is lacking. The university does particularly encourage the creation of spin-offs, “yes, we have five business developers, one patent advisor, one lawyer and good cooperation with several organizations to support commercialization/utilization” (respondent A).

The university has programs to establish and maintain linkage between industry and the university to promote commercialization of research outcomes (for example: exchange of staff between industry and the university; time off for staff to work in industry without loss of seniority; student placement in industry, industry people on university boards of councils), “there are a number of such projects, but it is not our department that are active in this.”. The university does also promote informal contacts between the university and companies and consider this linkage as vital in their commercialization strategy (respondent A).
5.4.2 University Support Structure

The university’s structure in terms of research commercialization is to develop a well-established TTO “as a vehicle” in this process. Today the university has LU Innovation which is focused on commercialization and is the link between the university research and the rest of the innovation system. The university has through LU Innovation the responsibility to find ideas and to make an initial judgment of the patent and commercial potential. LU Innovation has 12 employees with special competences within commercialization (e.g. patent, laws, finance and business advising). LU Innovation is responsible for the coordinating of the innovation process at Lunds University (Lund University a, 2006). If a researcher wants to commercialize his/hers research results respondent A points out that “it is the researcher that owns the idea. LU Innovation offers free advice on IP, finance, business development, legal services, communications and more. If one decides to move forward there is a network of organization that provide ‘soft money’, angel investors, supporting projects and competitions, Incubators and such”.

The mechanism or procedures used by the university to identify research with commercial potential is through the expose of services that LU Innovation can offer, which attracts researchers to voluntary contact them. According to the action plan LU Innovation has the ambition to yearly visit 400 researches in order to find inventions with commercial potential. This implies a more active “process of idea hunting” and this is a prioritized activity in this process. Respondent A claims that in “a coaching relationship it is the researcher/ entrepreneur who sits in the ‘driving seat’. It is he/she who decides. In our innovation system we (LU Innovation) assist him/her with evaluations and documentation. We can order market research and carry out reviews. With this data one will jointly decide if the idea is feasible or if his/her time and involvement is too valuable for a mediocre idea”.

Respondent A considers the description of the university’s commercialization models a complex issue since there are about 80 different stakeholders involved with dedicated and fairly overlapping responsibilities. The respondent points out that there also are competing initiatives; “generally it can be said that many players suffer from that the cost of administration is higher than the output”. The respondent believes that there is a risk in just having ‘one way’ as “it may cause ‘Stalinist’ consequences”. To get a more detailed “picture” of the system the respondent refers to articles published in Sydsvenskan and promotional material from respective organization. The various actors usually have a good working relationship which mutually supports projects at various stages and in various respects, financial, advice, publicity etc. (respondent A).

The university has a close relationship to Ideon Science Park, because of the near location. The university owns part of the Ideon brand and is part of the board. “We (Science Park) have a close cooperation when it comes to the development of the system, both with region and with the university” (respondent C). The TTO is in constant contact with the Incubators (Ideon Innovation, Ideon BioIncubator, Medeon, MINC, Venture-Lab and Rampen) and the university’s attitude toward the result obtained from Technology Park and incubators is that they are both worthwhile and effective. Respondent A points out that “the Technology Park and Incubators have very good initiatives even if the efficiency and the maturity is varying among the different initiatives”.

20 Sydsvenskan is a news agency in southern Sweden.
In figure 5.3 some of the various actors which take part of commercialization at Lund university are presented.

<table>
<thead>
<tr>
<th>Capital</th>
<th>Innovation Forum</th>
<th>TSE Villerstann</th>
<th>Affärsrådet</th>
<th>LUAB Utvecklingsbidrag</th>
<th>Lumteck</th>
<th>Teknoseed</th>
<th>Industrifonden etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counseling</td>
<td>VentureCup</td>
<td>CONNECT</td>
<td>LU Innovation</td>
<td>Teknopoli</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical environment</td>
<td>VentureLab</td>
<td>VentureHubs</td>
<td>Kvösen</td>
<td>Våkhuset</td>
<td>Ideon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Idea</td>
<td>Project</td>
<td>Start</td>
<td>Development</td>
<td>Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research &amp; Development</td>
<td>Research</td>
<td></td>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.3 Innovation Process, Lund University. Based on a manuscript written in Swedish (Action plan for commercialization, Lund University, 2006)

According to respondent C the university does not work actively enough to encourage commercialization. “It is difficult because it is tricky in Lund. The university has not quite managed to build this system. The university does not really have the senior management support for it. From the beginning we (Science Park and the university) had a close cooperation, but that has declined”. The respondent further stresses that the university has not yet managed to build a well-functioned system, “the role of the university should be to inform about the possibilities of starting a business, support in an early phase, funding for patenting since in some cases it is time to help with that through the holding company. It is also to actively demonstrate positive examples and to support scientists to become entrepreneurs. No, they do not work actively enough; I think they can do much more”.

Science Parks does not do anything to promote commercialization at the university, “inside the university it is themselves that illuminates the possibilities of commercialization” (respondent C). The role of Science Park in the commercialization process is to provide ideal conditions and to support the process and environment for the entrepreneur, first and foremost in the incubators, but also in the Science Park area. Science Park have a venture lab which is an incubator focused on students and is owned by the university but eager supported by Science Park. They also have three other incubators primarily for researchers. Outside the university there is LUAB, which is the university’s holding company; LUAB has the subsidiary LU Development which in turn has the funds, LU BIO and LU FOOD (respondent A).

Respondent C claims that there is a clear system; “there are clear roles, many of them overlapping, which I believe in this case is positive. But the execution needs to be developed in certain parts. LU Innovation must be developed” The respondent points out that in recent years there has been exchanges in the management and stresses that Science Park has in later years got few companies out from the LU Innovation structure; “I believe that you can use the resources much more efficiently and get more output”.

46
Considering the relationship between the actors involved in the system, respondent A stresses that the overlapping roles are “important for continuity, while it is important for the effectiveness with clear roles”. Considering if the structure is effective enough to stimulate commercialization or if this could be improved respondent A points out that “there are probably several ways to organize the organization, it is however important to have a long-term perspective, and the result cannot be evaluated in short-terms either”. Respondent C claims that “one can always improve, the university has not found the structure yet and it could have been more clear, both who will help and how to help”. In order to improve the university’s support of commercialization respondent A claims that “education and information on both elementary and advanced level, focus on combining innovations and entrepreneurs, and increase the use of ‘soft money’\(^{21}\), which can be used for working hours in early stages.”

In regards to which universities the respondents consider “best in class” when it comes to commercialization, respondent A says that “there are no objective measures recognized by everybody. My hope is that SNITTS\(^{22}\) will take responsibility for this. A measurement is always a simplification (and abstraction), but one must consider both quantity and quality. I believe the University of Gothenburg, and Chalmers making a very good job, they are probably ‘best in class’”. Respondent C argues that “I am not too familiar with how it looks in other places, but I hear from industry colleagues that there are more efficient structures in other places, but I cannot really say where”.

---

\(^{21}\) Supports assigned for efforts outside the ordinary activities

\(^{22}\) SNITTS Swedish Network for Innovation and Technology Transfer Support
6 Analysis

This section is structured in accordance with the generic model in the frame of reference. The model will be used in the analysis of the empirical findings.

To explore how Swedish universities’ commercialization activities and support structure influence the “Swedish paradox” the authors of this thesis made use of their own model, presented in section 3.1 in the frame of reference. The model encapsulates four major categories, (I) the national institutional context, (II) the university, (III), the various activities which universities may choose in order to commercialize its research, and (IV) the support structure that the universities use to facilitate commercialization. In this section, the generic model (see figure 6.1) is used as a basis for the analysis and will be applied on the four case studies; Halmstad University, Jönköping University, Linnaeus University, Lund University.

![Figure 6.1 Generic commercialization model](image)

This section consists of three parts. The first sub-section concentrates on the national institutional context. The second sub-section addresses what kind of commercialization activities the university undertakes in order to commercialize research results. The final sub-section discusses how the university’s commercialization support structure could be described.

6.1 National Institutional Context

In Sweden, the universities receive governmental funding via direct financial support of universities (fakultetsanslag). Funding allocated via foundations, research councils, governmental departments, the EU etc. are other ways of receiving external funding. Between 1993 and 2002 external funding increased in relation to the total budget, from 42.6% to 55% and recent years, some universities have received over 60% of total funding from external sources (Hällsten & Sandström 2002).
In the university system of Sweden, the government plays a major role and has great influence through financing and budget allocations. Although the economical aspect is important to consider in relation to university commercialization, it will not be discussed in detail in this thesis. However, the considerable reliance of external funding from the Swedish universities (Sellenthin, 2004), may explain the motivation among the universities to perceive commercialization as vital. Jönköping University claims that the involvement in commercialization makes it easier to get research funding (respondent B; Professor Emeritus of Industrial Marketing, Senior Advisor); Linnaeus university stresses that commercialization is a very important issue for the university and gives it a high priority. Commercialization is also said to be important for the local region since it generates growth (respondent C: Unit manager, Department of external relations).

The Swedish top-down model means that mechanisms, policies and institutions formed to facilitate commercialization are designed from the top. Goldfarb & Henrekson (2003) claim that top-down policies makes universities uncertain of whether to implement them or not. This fact supports the different motives for universities’ to commercialize its research. Some universities undertake commercialization activities because it is “a quality and value indicator for the research conducted at the university”, and other for utilizing research in accordance to the mission of the state, while others do not consider commercialization activities being of the highest priority. However, Breznitz, et al. (2008) stresses that it is vital that the way universities contribute in commercialization and interaction to wider society must complement the existing conditions for commercialization, both at the university and in the region in which it operates.

The third mission has received attention in debates and has caused a lot of controversy due to the various interpretation of it (Brundenius et al., 2008). In the Swedish model the university can choose how to fulfill this mission through different means, a fact which supports the interpretation made by each university when considering the term “commercialization”. Every single one of the investigated universities consider commercialization in terms of utilization. For example, at the Linnaeus University one stresses that utilization is a broader concept than commercialization since it refers not only to patenting and licensing, but also to activities which not generating direct revenues, such as interaction with a wider society.

6.2 Commercialization Activities

6.2.1 Patenting and Licensing

The empirical findings indicate that commercialization of IP in general is perceived as a relatively low priority among senior management at the universities. At Jönköping University one points out that they are not directly searching for IPs because of the difficulty to make money on patenting (respondent A; Business developer, Science Park). Furthermore, at Linnaeus University one claims that the prioritizing is probably pretty low (respondent A; Innovation advisor, Department of external relations), and in Halmstad it is “low to medium” (respondent A; Innovation coordinator, CEO Holding Company (HHUAB), Business Coach, Manager of pre-incubator, Science Park). The awareness of how many patents the university has sought and obtained over a period of five years was also pretty low in general among the respondents. Jönköping University even pointed out that “it is an in-house issue, but I wonder if anyone knows” (respondent A; Business developer, Science Park).
The Swedish government has made an effort to stimulate the university involvement in commercialization of IP by stressing agreements and internal policies between the individual researcher and the university (OECD, 2002a). An example of such of an agreement is one that Chalmers Technology Licensing has developed. This agreement implies that the university is taking over the rights of the invention from the researcher/researcher group, carrying out the patenting and licensing and then shares the profit 50/50 with the researcher or research group, after deduction of expenses (Henrekson, 2002). However, none of the universities in this study have any written statutes, regulations, policies or procedures dealing with IP. Halmstad University is the only university declaring that the university has, through contact with the University of Gothenburg, begun to review the possibilities of those kinds of agreements and thus be able to benefit from what has been created within the university. Jönköping University had a different attitude towards co-ownership and argued that the university has no interest in owning IP as it is “no real reason for it” (respondent B; Professor Emeritus of Industrial Marketing, Senior advisor). Furthermore, the respondent claims that the reason for not entering partnerships is because it is too expensive, and that the university does not have the skills in managing this issue since it is not part of their core activity. Lissonino, Llerenap, McKelvey, and Sanditovor (2008) claim that universities in general tend to rely much more on funding from the national government than on self-financing. These funding seldom come in form of competitive bids for mission-oriented financing, but rather in form of block grants. As a consequence researchers have little or no incentive to disclose the inventions to their universities’ administration, at the same time the universities administration lack incentives to chase for disclosures.

An attempt to encourage universities to enter partnership and become co-owners of IP is the infusion of holding companies, which were introduced in Sweden 1994. The idea is that the universities through the ownership of the holding companies should be able to become co-owners of research results. The mission of the holding companies is to buy and sell shares in projects and bring income to the university and in return, offer support and financing (Sojde, et al. 2003; Jacob et al. 2003). All the universities in this study are associated with a holding company, or a venture capital company (Jönköping University) with similar functions and structure as a holding company. Halmstad University believes that the holding company is good for the “milieu” but that more resources and capital is needed. Brundenius et al. (2008) argue that the obstacles for the universities are the holding companies’ lack of financial resources. This is supported by Jacob et al (2003) who argue that the holding companies often are under resourced both in terms of funding and competency and many of them are either dependent on government foundations or generally ineffective.

Lund University (respondent A; Business development manager, LU Innovation,) argues that publications is of higher priority than patenting since publishing gives more credits, even though the credits for patenting has increased. A general view is that the incentives for academics to establish IPR and pursue their commercialization of research are weak (Goldfarb & Henrekson, 2003) which may explain the low priority given to IP at universities. The Swedish government has introduced legislative changes and policies initiative aimed at pushing universities to get more patents out of their research. However, according to Goldfarb & Henrekson (2003) these policies have been ineffective in coating incentives for the researchers to become involved in commercialization, which also makes it problematic for the university to motivate the researchers to commercialize IP.
At Jönköping University one points out that “the only advice we can give to the researchers is to publish, publish, and publish because that is the only thing that will help their careers” (respondent B; Professor Emeritus of Industrial Marketing, Senior advisor).

Lindholm Dahlstrand, (2006) stresses that licensing has not been seen as the main activity for commercialization of university research and that direct licensing is limited from Swedish universities. In the USA licensing and patenting activities expanded among universities as a direct consequence of the federal policy initiative - the Bayh-Dole Act (Mowery, et al. 2001). Lunds University (respondent A; Business development manager, LU Innovation) also points out that licensing has traditionally been a low priority area at Swedish universities, and stresses that although licensing is common in USA and England, it has not been very successful in Sweden. The opinions regarding motives and priorities of licensing varies between the universities in this study, some sees no gain for the university to engage in this activity, while other see it as an opportunity and strategy to get the university to excel. Traditionally, licensing has not been the most prioritized area within Swedish universities, something that seems still to be true. However, the attitudes towards licensing as a commercialization activity seem to have been improved.

Halmstad University (respondent A; Innovation coordinator, CEO Holding Company (HHUAB), Business Coach, Manager of pre-incubator, Science Park) points out that the university has not licensed technology to any company (apart from spin-off companies) and claim that the university has no interest in or motive for granting licenses. This attitude towards licensing may have a direct effect on commercialization performance since Jensen and Thursby (2003) claim that low involvement of the university is affecting the efficiency of knowledge transfer.

Furthermore, the downside of a licensing approach is that the universities may not be able to capture the full value of their technology through licensing arrangement, and may therefore seek more direct involvement in commercialization through spin-offs (Lockett, Wright & Franklin, 2003). Jönköping University (respondent B; Professor Emeritus of Industrial Marketing, Senior advisor) is sharing the view of Halmstad University and does not see licensing as a priority for the university. At the same time they claim that a model for licensing is needed. One of the reason for why universities does not see this as a prioritized activity may be due to the difficulties to establish a well-developed licensing model. Overall, it seems that most universities in this study see licensing as an effective approach to commercialize but find it difficult to find the model to accomplish it. This is supported by Jensen and Thursby (2003) who argue that it can be problematic for universities to decide upon licensing fees, royalty fees and revenue sharing agreements due to the fact that university innovations seldom are fully developed. At Linnaeus University the goal of their innovation office, considering technology commercialization, is to increase the number of innovations from research through licensing, by encouraging professional support to researchers during the commercialization process (Linnaeus University, (2010a). According to Woods (2011) licensing is positive for the university in that sense that the university can make profit from it, a profit which can be allocated to support new areas of research or to develop new opportunities for teaching.

The only university in this study which has licensed technology is Lund University. The university claims that the interest for granting licenses is “to make the university shine” (respondent A; Business development manager, LU Innovation).
The university considers it necessary as a complement in the commercialization and the solution to develop a well-functioning licensing model is probably a close collaboration between universities to minimize costs and maximize knowledge exchange. According to Kim and Vonortas (2006) and Zhao (2004), licensing agreements have proven to be an effective mechanism for technology commercialization and argue that the agreements are often favored for the universities because of the increased speed to market and minimized financial risk.

6.2.2 Spin-off

Entrepreneurship has for long been identified as an important factor for national and regional economic development. It is also according to the European Commission (2000) recognized as a vital tool of technology innovation. All universities in this study consider spin-offs the highest prioritized commercial activity and according to Rasmussen, et al. (2006), university spin-offs is one major source of entrepreneurial activity. For Jönköping University (respondent B; Professor Emeritus of Industrial Marketing, Senior advisor) it is more important to focus on the entrepreneur and on the individual rather than on other commercialization activities, which explains the university’s strong focus on student entrepreneurship. Linnaeus University (respondent A; Innovation advisor, Department of external relations & respondent B; innovation advisor, project manager) points out that the underlying reason for spin-offs as the most prioritizing activity is because it is “a driving force of the regional economy”. Steffensen, Rogers and Speakman (1999) agree with that statement by claiming that commercialization through spin-offs contributes to the economic development in the university’s region and that the relationship between the university and its spin-offs can be a win-win situation for both parties, since spin-offs generally provides a role-model to promote further commercialization activities from the university. Even if spin-offs is considered to be the most prioritized activity within all universities, only Halmstad University and Lund University claim that they conduct activities in particular to encourage the creation of spin-offs. Some researchers claim that the growth rate of university spin-offs is significantly lower compared to non-university created spin-offs. Lindholm Dahlstrand (2006) points out that university spin-offs tend to have a relatively slow growth rate the first ten years, but that their size is more than doubled in the following five years. Furthermore, university spin-offs are more innovative than other new technology based firms, but do not use this to create growth. Sjölundh and Wahlbin (2008) point out that from ten spin-offs, started by Swedish researchers and teachers, three stayed relatively small, three grew to an annual turnover of over five million Swedish Crowns, two grew after five years, and one grew after five to ten years.

All universities in this study reported a strong prioritize of spin-offs among students. One reason for the strong focus on student entrepreneurship might be due to the fact that the education of students is considered to be the main task of university (Breschi & Lissoni, 2001). The universities in this study claim that they have created spin-off companies over the last five year, even though the number and the information available vary among the universities. Halmstad University (respondent A; Innovation coordinator, CEO Holding Company (HHUAB), Business Coach, Manager of pre-incubator, Science Park) could not provide an exact number. Linnaeus university (respondent A; Innovation advisor, Department of external relations & respondent B; Innovation advisor, project manager) claimed to have created six spin-off companies and about 40 spin-off companies have been created from Lund university. At Jönköping University, with its strong focus on student spin-offs, one of the respondents was unsure of the exact number, while the other respondent claimed that 83 companies were created in year 2010.
One problem with student spin-offs may be that the probability for company shut-downs is relatively high because of the tendency for teams to be broken up due to international exchange studies or that graduating students are employed by a large customer (Sjölundh and Wahlbin, 2008).

Only Lund University (respondent C; Marketing manager Science Park Ideon) reported a special focus on promoting and encouraging spin-offs among researchers, “approximately 70% of the companies in Science Park came from the university, and they have been represented both of students and researchers”. At the other universities, spin-offs among researchers seem to be a neglected area and all claim that the encouragement of spin-offs among researchers is an area which needs and can be improved. A reason for why spin-offs among researchers seem to be a neglected area might be due to the difficulties in getting researchers to take on an innovative role and thus become more entrepreneurial. Jönköping University (respondent A; Business developer Science Park) points out that one problem associated with researchers and commercialization is that there may be a conflict of interest in that sense that some researchers only tend to have an interest in research and no particular interest in commercializing (Innovator or Entrepreneur). This is supported by Etzkowitz et al. (2000) who claims that researchers generally have little interest in commercializing their research, or simply assume that the research result should somehow automatically produce rewards. Furthermore, Goldfarb and Henrekson (2001) claim that commercial benefits of academic research are not likely to be obtained in a system where the researcher owns the property rights. This is due to the fact that if the researcher’s faculty position is not ensured, the risk of failing in the pursuit of entrepreneurial ventures is increased. At Linnaeus University one claims that it might be that academia is not ready for being entrepreneurs, and that researchers in general are not used to start companies for example (respondent C; Head of collaboration and innovation department). Because of the fact that faculty inventors do not have enough business experience, the potential of entrepreneurial activities is hindered (Goldfarb and Henrekson, 2001). Daniels and Hofer (1993) claim that if researchers are involved in entrepreneurial activities, it may bring a strong commitment and knowledge of the technology. The downside is that the role of the entrepreneur is a key dimension in creating spin-offs and it might be that commercially inexperienced inventors tends to focus too much on the technical aspects rather than on the business dimensions. This problem is not unusual and therefore a strategy were researcher’s starts businesses together with other students, as Halmstad University mentions as a common strategy, may be a supplementary condition were e.g. necessary communication skills might be achieved through collaboration.

6.2.3 Human capital activities

All of the universities in this study considered the linkage between university and industry as vital in their strategy. Three of the universities (Halmstad University, Linnaeus University, Lund University) claimed that they have a program to establish and maintain the linkage between industry and the university to promote commercialization of research outcomes (for example exchange of staff between industry and the university; time off for staff to work in industry without loss of seniority; student placement in industry, industry people on university boards of councils). Wang and Lu (2007) point out that in order to create a successful commercialization and knowledge transfer, it is necessary for universities to establish strategies of facilitating interactions between the university’s faculties and firms. However, detailed information about the linkages at the universities was difficult to obtain. One reason for this may be due to the various interpretations of what the linkage between university and industry may incorporate. Brun-
denius, et al. (2008) points out that this linkage approach, which may be referred to the “third mission” has caused a lot of controversy due to the various interpretation of the task and has been seen as a relatively weak top down introduction for universities to be more involved in society. Lund University (respondent A; Business development manager, LU Innovation,) for example claims that the university has a number of such projects, but that this is not the issue of the respondents department. Halmstad University has “Hälsoteknikcentrum” which is considered the obvious linkage to industry for that university. Halmstad university has a tradition of research projects of product and service development conducted by students in industries (respondent B; Higher Education Counsil). NSB (2000) points out that collaborative approaches are beneficial for the university since students are exposed to practical problems and gaining access to new technological areas. This collaborative relationship may led to creation of new technologies and advancement in knowledge (Santoro & Chakrabarti, 2002; Pisano, 1990; van Rossum & Cabo, 1995; Frye, 1993).

The mobility of researchers as a form of promoting knowledge transfer seems to be a relatively absent form of knowledge transfer used by the universities. Jönköping University (respondent B; Professor Emeritus of Industrial Marketing, Senior advisor) claims that they currently do not have any personnel exchange between university and industry (even though the respondent points out that he hopes that this will be the case in the future). However, the respondent also claims that the university does encourage sidelines activities in their policy documents. According to legal regulations in Sweden researchers should be free to take appointments in companies i.e. there are no special employment conditions that stop them (OECD, 2002a). One reason for why mobility may not be especially encouraged at the universities may be due to the fact that mobility to industry has not been considered as a qualification in the career system of the researchers (therefore the researchers themselves do not consider mobility as a high priority) (OECD, 2002a). Linnaeus University (respondent C; Head of collaboration and innovation department) presented an idea of “researchers’ checks” in order to encourage researchers mobility. This approach is used to stimulate collaboration between university and industry in that region. The concept gives companies, who see possibility in co-working with a researcher, an opportunity to apply for checks (special funding aimed for researcher mobility) from the Regional Council to enable researchers to work within a company.

### 6.3 University support structure

#### 6.3.1 Technology Transfer Office

The role of TTOS\(^{23}\) in the support structure can be described as an “intermediary between suppliers of innovations (university scientists) and those who can potentially (help to) commercialize them, i.e. firms, entrepreneurs, and venture capitalists” (Siegel, et al., 2007, p. 641). The use of TTOS has increased in Sweden in recent years, both Lund University and Linnaeus University have commercialization offices and Halmstad University has future plans for it, while Jönköping University does not consider this a necessity. According to Jones-Evans, Klofsten, Andersson and Pandya (1999) each university are free to simplify and adopt the most appropriate definition of a TTO and build custom functions to commercialize its research. Some of the universities in this study emphasized other special entities, aimed at managing issues related to university-

\(^{23}\) Please note that the term technology transfer office (TTO) is used in a broader meaning in this paper. It means units inside universities that support commercialization of research results (see figure 3.4)
industry interaction and providing support and advises to facilitate commercialization, for example the entity for Contact and Interaction at Linnaeus University. At Lund University they have LU Innovation which is focused on commercialization and is the link between the university research and the rest of the innovation system. The university has through this entity the responsibility to find ideas and to make an initial judgment of the patent and the commercial potential. The formal function of TTOs is that it is the acting role in managing the interface between the universities and to verify external actors in the commercialization process. At the same time it works as an information point for firms which are seeking to connect to or get help from the most appropriate expertise within the university (Jones-Evans et al. 1999). At Linnaeus University a joint commercialization office (Fyrklövern) is used, serving four universities. If a researcher wants to commercialize their research results through the university he/she should go through the innovation office. "Our researchers are aware of the innovation office and when a researcher has an idea he/she will contact the staff at the innovation office. They have the first contact and the work will start at the innovation office. The office may in an early stage support with some funding, so that the researcher can go conceptualize the commercialization process in peace. The researcher can also get support in contacting external financers. The next step can be Science Park for example” (respondent C; Head of collaboration and innovation department). Jones-Evans et al. (1999) supports this and points out that the TTOs is an intermediate function, aimed to simplify the commercialization process for researchers and help to maximize resources.

Halmstad University claims that they currently do not have a commercialization office, but have future plans for it. The university is currently building a small Knowledge Transfer Office (KTO). Jönköping University is the only university in this study which does not considers TTO or a similar entity as vital or necessary (physically located at the university) since “it would be a bit strange if they had one” (respondent A; Business developer, Science Park). Having an office which intermediate between the university and verifies external actors may according to NUTEK (1995) be beneficial for the university since it is a good way to provide insight into the direction that education and research should follow (to address the specific needs of industry and society). An intermediate office is also offering an opportunity for the university employees to gain direct industrial experience by taking part in a variety of activities with external firms.

6.3.2 Science Park and Incubators

All universities in this study are linked to one or more Science Parks and Incubators. Sellenthin (2004) points out that Science Parks and Incubators are important for universities because of its unique character, with the establishment of new enterprises and its collaboration with the other public support actors. Thus, the relationship between the university and those entities is varying among the universities in this study. At Jönköping University one has chosen to completely outsource all activities (related to commercialization) to Science Park, and as co-owners the university maintain a strong influence in the development of Science Park. One of the respondents at the university points out two main reasons for the outsourcing, first, “it is better that professionals manage this” and second that the university is not able to provide the rewarding environment at the university as Science Park can (respondent B; Professor Emeritus of Industrial Marketing, Senior advisor). Mian (1996) and Westhead (1997) point out that one of the key principles of Science Parks and Incubators is the assessing of academic knowledge and expertise through the on-site location of businesses, together with the providing of a “catalytic incubator environment” for the transformation of “pure” research into production. Though, another respondent at
Jönköping University (respondent A; Business developer, Science Park) claims that there is a risk in moving the complete responsibilities because “it must be an issue for the university itself to handle”, and that “it is essential to have management and people who are passionate about this and have a personal involvement in it”. The importance of university leadership and passionate individuals are supported by Rasmussen et al. (2006) who claim that activities related to promote and increase commercialization are often started and run by a few key individuals. If one look beyond all the support structure and mechanisms one can find informal networks around these dedicated and motivated persons. These individuals are important to note in regards to the development of courses, programs, and incubators etc., because they can have positive effect on the universities’ ability to commercialize their research results.

Lund University claims that the cooperation between Ideon Science Park and the university is close because of the near location. One respondent (respondent C; Marketing manager Science Park Ideon) points out that they had an even closer co-operation a couple of years ago but that it has declined recently and that the TTO has to be developed in order to improve the innovation system. Moreover, another respondent at Lund University claims that “the Technology Park and Incubators have very good initiatives even if the efficiency and the maturity are varying among the different initiatives” (respondent A; Business developer manager, LU Innovation). This incongruity may be explained by the conflict of interest among the stakeholders involved in these kinds of organizations, something that is supported by Phan et al. 2005; Löfsten and Lindelöf (2002) who claim that initiatives such as Science Park are often results of public-private partnership, meaning that several stakeholders have influence over the missions and the procedures. As a consequence, it is complicated to evaluate the effectiveness of the Science Parks and Incubators, as the objectives and missions of the different stakeholders may differ considerably. It is also important to consider that the inventions from the universities may not always be directly attributed to Science Parks, rather it might lie in the work experience of the researchers as entrepreneurs or the market conditions (Felsenstein, 1994).

Sellenthin (2004) claims that in order to commercialize and interact with the surrounding society Swedish universities are required to create and sustain an effective commercialization process. Each university has the freedom to choose how to accomplish this mission through different means. In appendix 2 the characteristics of the commercialization support structure of each university are presented. Sellenthin, (2004) points out that in the Swedish context there is no single way of commercialization since the researcher has the full rights over his/her research results and the freedom to choose regarding the utilization of the research results. However, the supporting structure should consider this variety. In this study several of the universities point out that it is important not to have too many actors involved in the commercialization process and that it is necessary that each actor have clear and defined roles, but also that overlapping roles is necessary. At Halmstad University one emphasizes the importance of all stakeholders working together and that communication is vital. Each actor must know their role, but the roles must be overlapping (respondent B; Higher Educational Council). Furthermore, the respondent claims that there are clear roles in the system, while another points out that “a more simple systems and clear roles” would inspire universities to participate more vigorously in commercialization of research (respondent A; Innovation coordinator, CEO Holding Company (HHUAB), Business Coach, Manager of pre-incubator, Science Park). Lund University considers the description of the commercialization model as a complex issue as it includes about 80 different players with dedicated and fairly overlapping responsibilities; “generally it can be said that many players suf-
fer from that the cost of administration is higher than the output”, but the respondent also believes that there is a risk in just having “one way” as “it may cause ‘Stalinist’ consequences” (respondent A; Business development manager, LU Innovation). In a system with many stakeholders, the objectives and missions may differ considerably and it may be problematic to get the different actors working towards the same goal and vision. This is related to the argumentation of Breznitz, et al. (2008), who point out that in order to succeed it is not enough for universities to implement the top-down initiatives, but a change in the culture within the university is vital.

7 Discussion

This chapter will discuss the result of the thesis from a theoretical and empirical perspective.

In the beginning of the 90s there were considerable innovation policies debates in Sweden caused by a low innovation output from heavy investments in R&D, the so called ‘Swedish Paradox’. There are several formulations of the Swedish paradox but one of them is that the Swedish innovation system is not capable enough of generating output related to inputs (research capital vs. commercial results). One of the factors affecting the Swedish paradox is that the R&D results tend to remain in the universities (and other research institutions) and are not commercialized (Edqvist, 2010). Several studies have dealt with the Swedish paradox phenomena – which is supported in some studies while it is considered a myth in others. The impact of commercialization is difficult to predict and the impact may not be visible until many years after the invention left the university. The myth lobbyists claim that there are problems with making assessments of commercialization due to the fact that it is intricate to measure and can therefore not be linked to R&D investments. The authors of this thesis takes no position on whether the Swedish paradox is reality or a myth, however the authors believe that there is a need to investigate if insufficiencies in university commercialization activities and support structure can be identified consequently, influencing the Swedish paradox. The aim of this study was to explore how universities influence the Swedish paradox by exploring the commercialization activities and support structure in four universities.

However, it is important to note that the purpose, the way it is formulated, is difficult to fulfill since the determination of the influence may require quantified measurements conducted over a long period of time, and even by doing that it is not granted that the influence can be determined. A more reasonable formulation of what actually is fulfilled in this study, is based on the respondents perception of how the universities commercialization activities and support structure may be considered to influence the Swedish paradox. It is also important to take into account that an identification of possible gaps in university commercialization will not resolve or minimize the Swedish paradox since this phenomenon is influenced by other significant factors which are out of the scope of this thesis.

One drawback associated with university commercialization is the lack of measurement systems which indicates whether a system is effective or not, which also is directly related to the difficulties making assessments of the impact of commercialization. Due to the fact that it is difficult to make judgments about a system makes it problematic to make comparisons between models and draw conclusions about effectiveness upon that. It is also important to take into account that both internal and external factors are influencing the commercialization ability of a university, such as individuals, stakeholders,
budget allocation, technical direction and size of the university. Furthermore, these concerns lead to the question if it is possible or even necessary to have one single model of how commercialization should be conducted, a model which is supposed to fit all universities. The authors of this thesis believe that there might be a risk with a generic model. The use of a generic model might lead to implementation of models which a university might not be able manage due to internal and external factors which obstruct the effectiveness of the model due to the incompatibility.

However, it would be beneficial for universities to actively try to identify and apply certain elements from universities which are considered to have prominent commercialization systems. This would also allow universities to develop their own model which is compatible with each university’s vision, mission and goal. Furthermore, the authors believe that it would be valuable for both universities and the country if more rigorous studies were conducted on university commercialization system and its effectiveness. It is only then one can make assessments of the effectiveness of a system. One can also make a fair comparisons between universities in order to identify inefficiencies in the transforming of knowledge into the commercial sector and based on that take actions aimed to make the system more effective.

What appeared in the analysis of the empirical finding was that the commercialization support structure in some cases seems to be complex and unclear, and the information flow together with definition of roles in the system is vague. A lot of the knowledge seems to be on a managerial level or in the possession of a few individuals thus, the system may not be entirely clear for those who want to use it. A complex system may have an effect on or suppress the desire to commercialize, which means that the inventions will not make its way to commercial use. In order to simplify the system, a special unit which can navigate through the system and reduce information problem may be beneficial. It is also important to involve all the actors involved in commercialization, to clarify the roles and the procedure hence more ideas will have the chance to be identified, which in turn can lead to better commercialization performance. Furthermore, it is important to take into account the universities’ desire and ability to become involved in commercialization since too much involvement in commercialization may increase the risk of universities losing focus on their core mission - to educate and research.

The discussion about commercialization activities undertaken by the universities and its impact on the Swedish paradox, can conclude that in general the main focus of commercialization activities is spin-offs. This focus is of course positive since it is claimed to be an important driving force of the economy. However, the focus tends to be almost exclusively on student spin-offs, while the researchers seem to be a neglected area. Researchers possess valuable knowledge, and are important for the economy since a great deal of student spin-offs tends to be closed down due to certain circumstances after graduating. The universities do not encourage the researcher enough to become more entrepreneurial, leading to valuable knowledge remaining at the university and not put into commercial use.
However, it is important to take into account the conflict of interest that may occur between the researcher’s core mission – to research, and to become entrepreneurial. For enhancing commercialization performance a system where researchers are allowed to focus on researching and still remain innovators would be beneficial since researchers tend to be more of innovators than entrepreneurs and see their core activities in research and publishing. The researcher are allowed to focus on conducting research and the academic career of the researchers would not be threatened, while the commercialization activities are conducted by an entrepreneur with certain skills and interest in taken the invention into commercial use. Furthermore, an increased focus on the ability of researcher mobility (exchange for a limited period of time), as a contribution to the academic career of the researcher, would be beneficial for both university and industry in the sense that knowledge and experiences can be exchanged. This complementary relationship between universities and industry can lead to advancement in knowledge and the creation of new technologies in many different areas.

Generally the universities in this study do not tend to focus on patenting and licensing and are not particularly prioritizing the encouragement of this activity, a fact which may lead to ideas being lost. The authors are aware of the “teacher’s exemption” effects on the universities’ ability to influence the usage of research results. However, due to the fact that the property right per se is not a sufficient incentive for researchers to commercialize, a collaborative approach may be considered as more productive. The universities should more actively exploit the potential of collaborative agreements that would benefit both the researcher and the university and thus increase the possibility of a collective effort of commercialization. However, a collective collaboration may be a way to motivate the researcher. Nonetheless, it is important that the universities themselves see the potential in shared ownership.

For universities, important factors for success in commercialization are the attitudes and involvement of senior management. To increase commercialization performance the university needs a leadership that encourages and addresses commercialization as a central issue. It is also important to create a culture within the university which advocates commercialization. Because of the top-down system in Sweden, it might be difficult to create a culture within the entire university that stimulates commercialization, and in order to change a culture it has to be initiated from the bottom. Rasmussen et al. (2006) claims that commercialization should be part of the general activity of the university in order to succeed; “the challenge is to motivate, create a culture and get interplay at all levels, using appropriate initiatives as tools to achieve this goal” (p. 531). The authors of this thesis believe that a lack of culture is having an significant impact on how much of research results that is put into commercial use.

7.1 Methodological Reflections

By highlighting four different universities, the authors have been able to leverage an insight of how some universities relate to commercialization. However, the authors want to be careful not to generalize the results of this study. To be able to generalize the result, a more robust study including in-depth case studies and a broader range of respondents representing several parts of a university commercialization system would have been necessary. However, the authors believe that this study contributes to an insight of how universities commercialization activities and support structure can be described and based on the respondents perception how it can influence the Swedish paradox. The authors conducted a total of 17 interviews which was considered as a good
starting point for the empirical analysis. At some universities, it was easy to find personnel who were considered to possess relevant information through the website. At other universities the website did not give clear indications of the right contact persons. The authors also contacted the universities by telephone. Some universities did point us directly to relevant persons, while others had trouble knowing who they would send us to. In some cases, when the authors tried to find relevant respondents, the authors were several times referred to a person who had already been interviewed, since this person was considered to have the best knowledge in the investigated area. Although some people could not give us valuable information related to the research topic, the authors believe that these people are still important for this study thus; this may explain an ambiguity in the structure or lack of knowledge and information flow regarding commercialization of certain levels in the system. By reaching and interviewing different people at the universities and perceiving their knowledge and understanding about the topic, a more robust result is achieved.

The authors point out that the answers in the interviews are subjective and based on each respondent’s perception of the reality. To obtain a more representative reality of the system, a longitudinal case study would have been necessary with several units and organizational components represented in the sample. To include multiple perspectives of the investigated area, all stakeholders involved in the commercialization process needs to be represented. However, the number of stakeholders involved in the commercialization process tends at many universities to be numerous and are not always entirely clear, thus the authors of this study made a conscious decision to focus on people in the organization who would be considered to provide us with information which would be sufficient in leveraging a foundation of the investigated area. The authors are satisfied with the selection of respondents as they represents important positions in the organization and work close to commercialization, the respondents also represent different positions and departments which the authors believe is beneficial for this study.

An interesting aspect in the empirical findings is that responses from the respondents at some universities did not correspond. The responses in some cases even differed from the documented information that the authors obtained from university websites and the respondents. This incongruity can be interpreted in several ways; a complex area of research, a vague or complex commercialization system which is not conceptualized by everyone, lack of knowledge, or the fact that each respondent convey his/her own interpretation of the reality. Furthermore, the authors requested additional documents related to commercialization from the respondents at the universities, a request that unfortunately never was answered by some of them. The authors are satisfied with the results of this study, even though a longitudinal case study would have been interesting to conduct. The qualitative research approach using semi structured interviews gave the authors answers based on experiences and feelings. A quantitative method, such as a survey, could have been used in combination with the qualitative method in order to capture a larger amount of respondents. However the weaknesses with a quantitative method are that the approach limits the ability to understand the phenomenon shaped by the unique circumstances in which these occur, whereby more emphasize was placed on the qualitative approach in this study.
8 Conclusion

The following chapter presents the conclusions derived from the analysis and the discussion chapter.

The purpose of this study is to explore how Swedish universities’ commercialization activities and support structure influence the “Swedish paradox”. Although some claims that the Swedish paradox is a myth and the commercialization output cannot be put in relation to the investments in R&D, the authors of this thesis believe that an identification of insufficiencies in the commercialization system within Swedish universities is a valuable insight for universities, the region, and the nation. The qualitative study based on four cases and the analysis of the empirical findings resulted in several ideas of why research results may remain in the universities, and consequently also can influence the Swedish paradox.

- A too complex system may affect or suppress the desire to commercialize, which means that inventions will not make its way to commercial use. A clear structure in the system, with clear roles, and conceptualized by all involved actors are necessary to enhance the commercialization performance.

- Universities tend to focus on spin-offs as the core commercialization activity. The focus tends to be mainly on student spin-offs, while the encouragement of researcher spin-offs seems to be neglected. This might be due to lack of interest of researchers to become more entrepreneurial since the entrepreneurial role may affect their core mission and interest to conduct research. The fact that researchers tend to be more of innovators than entrepreneurs and see their core activities mainly in research and publishing, advocates a support system where the academic career is not affected.

- Generally, in this study the universities do not focus on patenting and licensing and are not particularly prioritizing the encouragement of this activity, a fact which may lead to ideas being lost. Both universities and the researchers would benefit from a collective effort in commercialization, hence a more active exploitation of the potential of collaborative agreements may be an approach.

- The top-down system in Sweden may influence the ability to create a culture within the university that is advocating commercialization, a condition which is vital for commercialization performance. In order to change a culture it has to be initiated from the bottom and encouraged by senior management. A lack of culture has an impact on how much of the research results that is put to commercial use. Commercialization should be part of the general activity of the university in order to increase commercialization performance, hence it has to be addressed by senior management as a central issue.
8.1 Further Research

As a social institution, the university has in recent years been forced to change in accordance with its commercialization activities. Nowadays, universities are expected to commercialize their research in addition to teaching and research. Through the various university commercialization activities and support structure discussed in this paper, and the thesis writing process, a number of suggestions for further research have derived. The topic of this paper encompasses other perspectives that need further exploitation to accomplish the focus of this study.

First, the authors believe that studies conducted with the aim of investigating and identifying measurement parameters, to explore how efficient/effective universities commercialize its research would be interesting. Furthermore, the authors are convinced of the benefits of conducting a deeper analysis of the effectiveness of universities commercialization support structure. By understanding the different roles and the support universities achieve from these institutions, it would be possible to identify the weaknesses and the strengths of this system.

The authors also believe that a study could be conducted on a university which has had great success with commercialization. The purpose of a study like that would be to find patterns and motives to investigate the possibility to duplicate relevant elements in the model of the successful university to others, which have not been equally successful with their commercialization result. Moreover, the authors recommend that in order to gain a reliable result, one need to investigate commercialization performance under a relatively long period of time, since short term result may not be as reliable or valid.
9 References


Hellström, T., Jacob, M., & Wigren, C. Organizing for third mission: Structural condition for outreach and relevance at two Swedish Higher Education Institutions. Center for Innovation, Research and Competence in the Learning Economy (CIRCLE), Lund University, Sweden. Working paper and can be provided by the authors.


Appendix 1 – Interview Outline

The interviews were completed by follow-up telephone questions when the authors wished for complementary information and to avoid misinterpretations.

Introduction

1. Can you give a short description of your university?
2. Position and contact details of interviewee

Overview

3. Does the university have a statement in relation to its philosophy (vision, mission, etc.) concerning the role of commercialization?
4. What does the university considers as commercialization?
5. What is the university’s motivation for undertaking commercialization activities?
6. Has the university some preferred modes of commercialization (please prioritize with “1” as highest):
   1. Patenting
   1. Licensing
   1. Start-ups
   1. Sponsored research
   1. Other (please specify)
   Why? / Why not?
7. Does the university have any goals set in relation to commercialization results (for example to achieve income equivalent 5% of research income from commercialization)?
8. Which could be done to improve the university’s support of commercialization?

Technology Commercialization (patents, licensing)

1. Has the university licensed technology to any company (apart from spin off companies)?
2. What is the university’s interest/motive for granting licenses?
3. Which university entity handles: spin-offs; intellectual property licensing; contract research etc.?
4. Does the university have written statutes, regulations, policies and/or procedures dealing with Intellectual property, and if so, how could the university’s intellectual property policies be improved?
5. Does the university have any mechanism or procedures by which research with commercial potential can be identified? Please explain.
6. How many patents has the university sought and obtained annually over a period of 5 years? How many of these have been licensed to industry? How many of these are overseas?
7. Is commercialization of IP a low, average or high priority with senior university leadership? Please motivate.
Entrepreneurial Activities (spin-offs, sponsored research)

1. Has the university created any spin-off companies over the last 5 years? Are details about the success of university-inspired spin-offs companies available?
2. Does the university do anything in particular to encourage the creation of spin-offs? Why/why not/what kind of activities?
3. Does the university have any agreements with external sources for receiving special funding for conducting research projects?
4. How does the university measure performance (e.g., number of patents, number of licenses, and number of startups)?

Human Capital Activities (shared personnel, labor movement, Informal and pre-formal discussions)

1. Does the university have any program to establish and maintain linkage between industry and the university to promote commercialization of research outcomes (for example: exchange of staff between industry and the university; time off for staff to work in industry without loss of seniority; student placement in industry, industry people on university boards of councils)?
2. Does the university promote informal contacts between university and companies? I.e. invitations to present research findings in non-academic setting, conferences etc.
3. Does the university consider this linkage as vital in their commercialization strategy?

Science Parks/ Business Incubators/ Commercialization office/ Holding company

1. Does the university run, or is it associated with, any technology park or incubators? Who manage these? Are any details available about the result derived from these facilities, especially any information on their financial result and economic impact?
2. What is the university’s attitude toward the result obtained from Technology Park and incubators? Are they worthwhile or effective? What could be done better?
3. What is the university’s structure in terms of research commercialization? For example, does it have a dedicated entity (maybe a company) created for this task? What is the relationship between that entity and the university?
4. Has the university used any holding company to assist in commercialization? Does this strategy bear fruits? What could be improved?
5. Does the university have a Commercialization office or similar entities: when did the university start the office; is there a written policy governing the role, management and operations of the office; how many people are employed in the office (what are their qualifications; how long have they been employed); what turnover goes through the office; are statistics kept in relation to the performance of the office (number of contracts; type of contract)?
6. Should the university have a commercialization office, or is there a better model?
General Views

7. What strengths and weaknesses can you identify in the university commercialization policies and practice?

8. What would inspire Universities to participate more vigorously in commercialization of research? What role, if any, do you think government should play in research commercialization?

9. What should be done, if anything, to improve the university’s commercialization performance?
Appendix 2 – Characteristics of the commercialization support structures

Halmstad University innovation support system, based on a manuscript written in Swedish (Halmstad University, 2010c)

Linnaeus University: Process and Actor map, Commercialization of research findings. Based on a manuscript written in Swedish (Linnaeus University, 2010a)
Innovation Process, Lund University. Based on a manuscript written in Swedish (Lund University, 2006a)

| Capital          | Innovation Skåne | TES Villanslän | Affärsånglar | LUAB Utvecklingsbidrag | Lumitec | Teknoseed | Industrifonden etc.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Counseling</td>
<td>VentureCup</td>
<td>CONNECT</td>
<td>LU Innovation</td>
<td></td>
<td></td>
<td></td>
<td>Teknopol</td>
</tr>
<tr>
<td>Physical</td>
<td>VentureLab</td>
<td>VentureHubs</td>
<td>Kuväsen</td>
<td>Våthuset</td>
<td>Ideon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>Idea</td>
<td>Project</td>
<td>Start</td>
<td>Development</td>
<td>Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ideas from the</td>
<td>The project</td>
<td>Company is</td>
<td>The business is</td>
<td>The business is</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>university and the</td>
<td>tested,</td>
<td>started and</td>
<td>transformed and</td>
<td>established on the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>industry is</td>
<td>evaluated</td>
<td>commercialization</td>
<td>adjusted according to</td>
<td>market and a growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>evaluated</td>
<td></td>
<td>commences.</td>
<td>the first contact with</td>
<td>phase commences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research &amp;</td>
<td>Research</td>
<td>Education</td>
<td></td>
<td>the market.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Commercialization process, Jönköping University, expanded through empirical data from the authors’ interviews.