From Zero to Hero:

A Comparative Case Study on Managerial Capability Development in Incubated Start-ups

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Abstract

Authors
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Date
May 25th 2015

Background
Exploring the literature stream of the knowledge perspective as well as that of start-ups and incubation, and subsequently bringing the two together.

Aim
To construct propositions regarding the process of developing managerial capability in incubated start-ups.

Methodology
The study entails 3 start-ups that provide a high technology product. The development of managerial capability was explored through a comparative case study in which founders, business coaches and externally recruited employees where interviewed.

Findings
The process of managerial capability development in incubated start-ups can be deconstructed into two processes, knowledge acquisition and knowledge integration, where each process present distinct attributes in different stages of development of the start-up. This managerial capability formation is an incremental process that drives growth.

Keywords
Business incubator; Start-ups; Knowledge acquisition; Knowledge integration; Managerial capability
Acknowledgements

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Many thanks as well to all our interviewees in Kulipa, SenionLab, Graphensic, LEAD and InnovationskontorEtt for making their best to make a space in their tight schedules to meet us and answer our sometimes tricky questions. The torment of our constant e-mails never prevented them from always being willing to help us.

We also owe our most sincere gratitude to all our fellow SMIOs 2013-2015. They have been our first line of support to release frustration, share the joy of achievements, clarify doubts, and to make sense of everything. This was not only during the writing of this thesis, but also during our time studying together. Thank you guys for two amazing years!

Finally, the authors want to thank each other for making this five-month journey an enjoyable one. This experience taught us to cope with struggles with humor, face challenges with a positive attitude and celebrate even our minor successes in every step of the way.

Alice:- Nobody ever tells us to study the right things we do. We are only supposed to learn from the wrong things. But we are permitted to study the right things other people do. And sometimes we are even told to copy them.

Mad Hatter:- That is cheating!

Alice:- You are quite right, Mr. Hatter. I do live in a topsy-turvy world. It seems like I have to do something wrong first, in order to learn from what not to do. And then, by not doing what I am not supposed to do, perhaps I will be right. But I would rather be right the first time, wouldn't you?
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CHAPTER 1: Introduction

“Start-up success is not a consequence of good genes or being in the right place at the right time. Success can be engineered by following the right process, which means it can be learned, which means it can be taught”.

Eric Ries

We are a lucky generation. Being born in the 20th century, we have witnessed mankind making giant leaps forward in every field. We live in a time in history when change is so accelerated that the world we knew 10 years ago is significantly different from the world we live in today. Much has been said about the increasing pace of globalization and change and the constant outburst of innovative ideas and technological breakthroughs that characterize the present times. One thing is clear: the role of firms in this process is fundamental. Computers, mobile phones, internet or e-commerce would be hard to imagine without Apple, Microsoft, IBM, Ebay or Google, just to name a few. However, it is rarely the established industry giants who infuse dynamism and inventiveness in the business world and therefore, in our lives (Audretsch and Acs, 1994). The engine behind it is usually found in the churning emergence of a multitude of agile small new firms (Raynolds, 2000) which attempt to commercialize bold novel ideas. The study of the origins and development of these new ventures has always been important, but has received substantially more attention in the past two decades (ibid). With the dot-com burst in the 90s, the entrepreneurial business field started to notice a special kind of new business dynamo which is referred to as ‘start-up’. Nevertheless, in spite of their economic importance, the study of the problematics surrounding start-ups remain largely unresearched.

1.1 The Issue

A start-up is not only a newly created firm. It is also the result of the inventiveness and determination of entrepreneurs, who envision a great future for their innovative ideas and technologies and push through chaos to make it happen, and to make it happen in big dimensions.
It implies great risks, but also great pay-offs. However, when it comes to start-ups not everything is a bed of roses. The battle for success is extremely tough and only a handful of ventures manage to succeed. The complexity of the start-up process results in high figures of failure (Peña, 2002). In the same line, Giardino et al. (2014) state that sixty percent of start-ups fail during the first five years, while Nobel (2011:1) simply states that “most companies fail [...] fail is the norm”.

There are several studies attempting to analyze the underlying reasons for start-up failure. Giardino et al. (2014) for instance, present fifteen different aspects of failure. Among others; lack of resources (human, physical and economical), time pressure, and low experience in business. The time pressure and lack of resources often forces the start-ups to implement a loose and informal organizational structure without traditional managerial arrangements. Instead, complete empowerment of each individual within the start-up represents the most common strategy. Furthermore, in counterbalancing the lack of resources, there is a crucial need of developing expertise in a wide variety of areas required for running a new business. Normally, however, this may not be the area of specialization, nor area of interest of the individual entrepreneur (ibid).

The most recurrent theme in the explanation of start-up failure follows from that last argument: some start-ups struggle with the development of a specific type of knowledge which the founders may not be familiar with. Probably the most prominent voice in this discussion is Eric Ries, a guru in the field of start-ups who wrote his bestseller “The Lean Startup” (2011) based on the idea that entrepreneurship is not having an idea but the process of building a company based on it. Ries (2011) claims that the process of company building requires sharp management knowledge, and failing to realize that and develop those skills in a timely manner is the main reason for start-ups to fail. This argument is replicated consistently in literature. Holmes and Haswell (1989) found that most failure cases they studied were due to managerial inexperience or incompetence in the start-up. Following this line of argument, Nobel (2011:1) found that entrepreneurs tend to be single-minded, “wanting the venture to be all about the technology [...] without taking time to form a balanced plan”. Cusumano (2013) argues that success often depends on founders having solid knowledge about marketing and sales, while Thornhill and Amit (2003) argue that deficiencies in business-related knowledge and the consequent inability to cope with the liability of newness are behind the high rate of start-up failure. All in all, it could be argued that in these new companies that usually result from the attempt of commercializing a technical innovative idea developed by technological specialists and researchers (McKelvey and Heidemann Lasse, 2013), there is an acute need to access managerial knowledge in order to be able to build and run
the company that brings the product to the market. An amazing, innovative, groundbreaking product by itself is not enough.

The centrality of knowledge as a crucial aspect for the firm is not just a loose idea applicable only to start-ups but a growing body of literature that provides a new perspective and an emerging paradigm in the business field. In this age of increasing globalization and increasing pace of change, the inputs and tools that once were the sources of competitive advantage are becoming more mobile and thus going through a process of commoditization (Friedman, 2006). In order to compete successfully in this fast-changing environment, firms and academics in the business field started to look into the current pattern of wealth creation. The new emerging paradigm is based on the belief that in the 21st century, the success of a company will be based on the possession, exploitation and development of a company’s single most valuable asset: knowledge (Ichijo and Nonaka, 2006). This idea led Grant (1996a) and Spender (1996a) to start theorizing about what they came to call the ‘knowledge-based view’ (KBV). The main proposition of the KBV is summarized by Kogut and Zander (1992) when they argue that the purpose of an organization is to create, transfer and transform knowledge into competitive advantage.

The task of defining what ‘knowledge’ really is has occupied thinkers since the early days of the Western civilization until contemporary times, without succeeding to reach a consensus about a single definition that encompasses all relevant aspects (Grant, 1996a). However, there is little controversy in saying that in broad terms knowledge is ‘that which is known’ and that encompasses elements of both ‘knowing-about’ - i.e. being acquainted with something, being able to explain it (Machlup, 1980) - and ‘knowing-how’ - understood as being able to perform certain action. This act of knowing is possible only within the individual minds of human beings and thus knowledge is acquired by and stored within individuals. Furthermore, given that the human brain has cognitive limits, individual knowledge is acquired and stored in a highly specialized form. This implies that there is a trade-off between depth and breadth of knowledge. Nevertheless, the productive activity of a firm requires a diversity of knowledge which needs to be combined to be able to perform collectively. It is not efficient nor cognitively possible for an individual to learn all the knowledge required for a firm to deliver a product or a service to the market (Grant, 1996a, 1996b). This statement led Grant (1996a) to theorize about what he believes to be the primary role of the firm: knowledge integration.
The integration of the individual knowledge held by specialists is at the core of what Grant (1996b) calls ‘organizational capability’. This term is defined as “a firm’s ability to perform repeatedly a productive task which relates either directly or indirectly to a firm’s capacity for creating value through effecting the transformation of inputs into outputs” (Grant, 1996b:377). Every action performed by a firm is enabled by a certain organizational capability, which resulted from the integration specialist knowledge bases of a number of individuals (ibid). For example, a marketing campaign would not be possible without the designer that created the visuals, the marketer that designed the channels, the engineer that developed the product, etc. The formation of organizational capability is how knowledge goes from the individual mind to the collective level.

After setting this theoretical platform, it is possible to conceptualize the above mentioned problem found in start-ups as deficiencies in organizational capabilities given by the lack of specialized knowledge resources in business-related fields. This issue is the starting point of this thesis. However, the focus will not be on the problematic itself but on the reverse argument. If companies manage to survive the chaotic first years as start-ups, it is possible to deduce that they did so by succeeding in developing managerial capabilities.

What can be inferred from the above-mentioned explanation about the unbalance between knowledge fields in start-ups, is that in these newly created firms the knowledge is specialized into two broad knowledge categories: technological and business. When describing the knowledge requirements of a start-up, McKelvey and Heidemann Lassen (2013) also differentiate between those two fields of knowledge, with the difference that the business knowledge is divided into external market issues and internal business aspects. For the sake of simplicity and relevance, in this thesis business knowledge will be understood as the combination of external and internal business knowledge, in opposition to the knowledge that is connected to the technology of the product. It comprises undertakings such as sales, strategic planning, financial control, human resource management, marketing and funding. If the problematic described above refers to the fact that the knowledge equation in start-ups tends to be unbalanced due to the heavier weight of technological knowledge, then survival will be dependant upon the ability to balance the equation by acquiring business knowledge. This would represent a situation in which a start-up has a technological product which serves certain market need and drives the development of a business organization. Therefore, in this study the concept of managerial capability will be understood as the ability of a firm to combine specialized technological knowledge with business specific knowledge in order to deliver a successful product to the market.
To be able to study the process of building business knowledge assets from its origins and to isolate it within the limits of a single start-up experience, this thesis will center its attention in a special business context in which the previous specialized business knowledge at the moment of foundation is nonexistent. This implies looking at start-ups that have been created by technology specialists that develop and commercialize a product without having previous start-up experience or educational background in management. Entrepreneurs undertaking their first venture are referred to as ‘novice entrepreneurs’ (Wright and Mosey, 2007), a state which originally comes with a myriad of challenges. Moreover, if these first-time entrepreneurs are university-based technological specialists, they are likely to face several additional challenges due to the noncommercial environment of an academic setting. Preeminent researchers and technological specialists may be entrepreneurial in their research or in their areas of specialization, but often times have difficulties in seeing the business value (Shane, 2000).

Posing these statements in the terms presented by Grant, it could be said that university-based start-ups founded by novice entrepreneurs have an acute need to acquire specialized business knowledge in order to develop managerial capabilities required to survive and grow. To be able to build a company upon their innovative ideas, they need to swiftly access business knowledge either by learning or by incorporating individuals who possess it and integrate that knowledge to form the managerial capabilities they need. In this context, an external actor that is designed to assist with the above stated challenges are business incubators. Its main function is to aid future entrepreneurs in their first business activities by placing new firms in the same location, providing the required knowledge either in the form of personal mentoring, basic infrastructures or financial resources (Mas-Verdú et al, 2015; Warren et al. 2009). The importance of incubators and network relations is considered essential in the learning processes of start-ups, allowing them to acquire knowledge from several opportunities and thus increasing the probability for creating competitive advantages and achieving rapid growth (Kambil et al, 2000; Hansen et al 2000). Following what has been stated above, incubators can assist and support start-ups in achieving a balanced knowledge base of technological and business-related knowledge in order to integrate it to form managerial capability.

In order to address the purpose of this research, one extensive comparative case study was conducted. The research involves three very different yet comparable case companies; all are younger than five years, founded by novice entrepreneurs based in Linköping, Sweden and were during the research residing in an incubator. However, the products they are selling greatly vary
in terms of level of technological complexity. Same variance can be found among the founders which can all be considered technologically specialized, while their level of experience spans from being engineering students to researchers conducting world-leading work. The empirical collection was of a qualitative character, and involved interviewing important actors, who are or have been part of the start-ups’ progress.

Reviewing literature that would support this study it was found that there is a significant research gap regarding the connection between start-ups and knowledge. Given the economic importance of start-ups and their struggles in terms of knowledge resources, it is surprising that the topic of knowledge and knowledge integration in the setting of start-up ventures is significantly under-represented in literature. Instead, the existing knowledge-based literature tends to be focused in the context of established companies composed by numerous individuals and multiple functional divisions. The scarce start-up literature is mostly practical and “hands-on”, giving advice on how to best exploit the current external conditions (e.g. Romanelli, 1989; Shephard et al., 2000). The few articles that undertook a theoretical perspective on the issue of start-ups based their research on classics within organizational learning (Johanson and Vahlne, 2009) to explain young firm growth (e.g. Barkema and Vermeulen, 1998) or on external aspects such as networks, entrepreneurial clusters or other kinds of social capital as a source of knowledge inputs and thus a driver for growth (Tolstoy, 2010; Yli-Renko et al., 2001). Start-up companies present unique characteristics that call for special attention in the topic of knowledge integration and organizational capability development. In addition, this scarce literature on the topic of start-ups focuses on all new ventures without making a differentiation between incubated and non-incubated start-ups. Therefore, little progress has been made in order to understand how incubatees develop within the incubator (Hackett and Dilts, 2004).

These gaps in the theoretical foundations that would support this study not only speak about the relevance of conducting this research but also they highlight its explorative nature. The lack of studies in terms of the connection between start-ups and knowledge, and the phenomenon of start-up development during an incubation process make this study an exploration of uncharted territory. Therefore, the aim of the research will not be to develop structured theoretical models to describe a narrow aspect of a well-developed problematic. Given the time restrictions and content limits imposed by a Master’s thesis such purpose would be over-ambitious. On the contrary, being this an explorative study it is considered to be more appropriate to develop
propositions that suggest how the studied phenomenon may be approached, and which are the actors, events and processes that are involved.

1.2 The Purpose

In this study a knowledge perspective on the development of start-up ventures will be adopted. The focus will be set on the need of complementing technological knowledge with business knowledge that is required to build a company based on a technological product;

*The purpose will be to construct propositions regarding the process of developing managerial capability in incubated start-ups*

In order to explore this process from its origins, the study will focus on start-ups founded by novice entrepreneurs with backgrounds in fields other than business administration and management. The studied firms are incubated in the LEAD incubator located in Linköping, Sweden. Moreover, their founders are either researchers or students at Linköping University. In addition, the focus on the concept of ‘capability’ instead of ‘knowledge’ is intentional. Since conceptually knowledge lies within the individual, and the interest of this thesis is not in the individual sphere but on the organizational one, aiming at identifying the development of capabilities implies that the knowledge will be traced in the empirical study until the point it becomes integrated to form organizational actions.

1.3 Contribution

The contribution to the existing body of literature is an approach to the unexplored topic of a knowledge perspective on the development of start-up ventures. Deepening the understanding about how managerial capability is developed may generate new approaches to study early start-up extinction and possible mitigation actions. As Ichijo and Nonaka (2007) argue, many firms fail to translate the knowledge theory into an understanding of the suitable strategies that they should follow since the connections between knowledge and business outcomes are still vague in literature. This study intends to shed some light on this link in early stages of firm life. An increased understanding of how start-ups build knowledge assets and as a consequence increase their chances of survival, can in turn bring about a beneficial impact for the economy as a whole since start-ups are important job creators, sources of innovative ideas and therefore also national wealth (Peña, 2002).
Moreover, the results may also be valuable for incubators specializing in assisting high-technology start-ups connected to academic entrepreneurs. The study will provide an insight on how to conceptualize the support they provide in terms of the incubatees’ knowledge requirements.

### 1.4 Outline of the Thesis

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<td><strong>1. Introduction</strong></td>
<td>The introduction chapter aims at displaying what the reader can expect from this thesis as a whole. The central piece is the purpose, which results from the presentation of the issue, its relevance and scope as well as the empirical field and the theoretical perspective from which it will be studied.</td>
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<td><strong>2. Method</strong></td>
<td>The method chapter intends to present to the reader the procedures that were used to attain the purpose of the thesis and why they were deemed appropriate for providing validity and credibility to this study. These methods include the research design, the empirical research process, the data analysis and the research quality. Moreover, the limitations attributable to this study will be outlined by the end of this chapter.</td>
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<td><strong>3. Theoretical framework</strong></td>
<td>This chapter provides the conceptual platform for the purpose that will support the analysis of the issue. It will aim at providing the reader with a complete understanding of the key concepts: knowledge and start-ups. Since this relation is underdeveloped in literature, this chapter will provide concepts that will help the authors to explore the connection, namely knowledge acquisition and integration as well as the knowledge environment given by novice entrepreneurship and business incubation.</td>
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<td><strong>4. Empirical study</strong></td>
<td>This chapter displays the empirical findings resulting from a series of personal interviews with actors within the three case companies: Kulipa, SenionLab and Graphensic. The chapter is structured to present the information by comparing each case in terms of certain characteristics that are connected with the temporal stages of development of start-ups, namely verification and growth. From this chapter the reader can expect to understand how the companies’ experiences differ or not in critical aspects.</td>
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<td><strong>5. Analysis</strong></td>
<td>In this chapter, the empirical findings are analyzed under the light of the knowledge-perspective as the overarching framework of reference. The cases will be studied through the description of the actors and processes that are involved in the development of managerial capability in the case companies. This analysis will be based on the study of the patterns of knowledge acquisition and knowledge integrations that were identified.</td>
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<tr>
<td><strong>6. Conclusion</strong></td>
<td>This is the final step in delivering what was promised in the purpose. This chapter aims at presenting the propositions that can be deduced from the conceptual analysis of the empirical case. Moreover, the chapter will also emphasize the managerial implications of these propositions. This chapter symbolizes the end of the reasoning cycle that started with the introductory chapter.</td>
</tr>
</tbody>
</table>
CHAPTER 2: Method

The following methodology chapter presents the practical steps undertaken throughout the five-month research pursued in order to effectively investigate the research’s purpose, where understanding how incubated start-ups develop managerial capability is in focus. The aim of this chapter is to unveil the different stages of the research process itself and present the different procedures and methods used in order to acquire and analyze data. The subsequent section starts by describing and arguing for the empirical study, in this case a comparative case study. After that, a more detailed explanation of the empirical research process will be provided. Lastly, the chapter will be concluded with a discussion regarding the quality and validity of the thesis as well as its limitations. The chronological proceedings of the methodology chapter are illustrated in the Figure 2.

![Sequential logic of the methodology chapter](image)

2.1 Research Design

Already from the beginning the choice was made to study the development of knowledge even though the context of where to study knowledge changed as our familiarity with the topic increased. The underlying knowledge processes in start-up companies turned out to be underrepresented in academia, and thus it was considered an interesting area where a deeper understanding of the phenomenon would be possible. Studying processes is said to be a rewarding approach when one is interested in how a managerial or organizational phenomena occurs and evolve over time (Langely, 2013). Even though understanding processes is proposed as an important key for improving management knowledge, process studies have still been rather neglected (Langley, 2013).
As the research intended to obtain a better apprehension of the development of managerial capability undergone by a start-up, it was necessary to gain a deep understanding of all the stages the organization went through. Thus, it was necessary to investigate the entire period from business idea to where they find themselves today to be able to follow the development of managerial knowledge. The prerequisite of deep understanding regarding how an intangible factor, such as knowledge, evolves made a qualitative approach appropriate for this research. The choice was based upon Bryman and Bell (2003) who favor qualitative research when the research examines a phenomenon that is not well understood and thus is in need of a detailed and intensive examination.

2.1.1 Comparative Case Study

The method of choice for this research is a case study, which according to Eisenhardt (1989) is a fruitful strategy when looking into the dynamics present within single contexts. Furthermore, this research will include multiple cases, which will be used as the basis from which the theory will be developed inductively. The advantages of a case study for this research lies in the fact that the knowledge processes of the start-ups could be studied in the context where they take place, and patterns of events could thus be recognized. Even case studies involving a small population are said to yield interesting insights from comprehensible narratives, even though the might not result in the affluence of data that can lead to statistical treatments (Labuschagne, 2011).

However, in order to better understand the phenomenon of knowledge processes in a start-up, a comparative case study was chosen. The reason for this was due to the logic of comparison, i.e. that a phenomenon could be more fully grasped when compared in relation to two or more contrasting cases (Bryman and Bell, 2003). This comparison will accommodate for highlighting unique features of each case, but also recurring features in the different cases that could imply a degree of importance when realizing growth for start-ups in general. Thus, aspects that are in common between the cases are given just as much significance as those that differentiates them (ibid, 2003). The reason for choosing a comparative study also lies on the fact that it facilitates theory building, since the researcher more easily can establish under which circumstances a theory does or does not work (Eisenhardt, 1989). Using a comparative case study has naturally gained some criticism too, where for example Dyer and Wilkins (1991) argue that the researchers tend to focus on how the different cases are different, and tend to forget about the specific contexts they are operating in. Nevertheless, our opinion remained that the benefits of comparing cases surpassed this criticism, though it was worth noting.
2.2 Empirical Research Process

The following section will describe how the empirical research was conducted. Firstly, the method for sampling will be presented and argued for, as well as how the case companies were chosen. Following, a more detailed description of the interviews that were performed will be provided.

2.2.1 Sampling

The sampling method used for this research was ‘theoretical sampling’ (Eisenhardt, 1989). As this research is a multiple case study, where theory will be the output, the aim was thus to find theoretically useful cases. A ‘theoretically useful case’ includes “those that replicate or extend theory by filling conceptual categories, or they may be chosen to fill theoretical categories and provide examples of polar types”, i.e. cases that demonstrate the phenomenon being studied in a clear way (Eisenhardt, 1989: 537). When doing a case study research, random selection, is neither necessary nor preferred thus, theoretical sampling is favored (ibid).

Hence, for this research, Pettigrew’s (1988) line of argument was followed. According to this author, when only a few cases can be studied, due to limitations time and resources, as is the case for this Master’s thesis, it is sensible to choose cases that are extremes or polar types in which the process is “transparently observable”. Thus, the aim was to find start-ups that reflected various levels of technical specialty of the founders, and consequently explore whether this may affect the development of managerial capability. Eventually, these observable cases could extend theory to a broader range of organizations.

2.2.2 Start-up Identification

After the sampling method had been established, the next step was to search for companies that could be used as cases. In order to find theoretically useful cases that would illustrate the issue in question in a clear way, it was necessary that they fulfilled a list of criteria;

1. This thesis required perspectives that would provide an overlook of the start-up experience from its origins to present times in order to gain an in-depth understanding of it. Therefore, it was crucial to find companies in which we could access individuals in the start-up that have participated from the very beginning and still remain highly active in the organization.
2. Furthermore, in order to obtain a reliable record of the learning processes, the start-up could not be more than a few years old. Otherwise, there would be a bigger risk of overlooking crucial factors that have been forgotten as a result of time.
3. Lastly, it was necessary to find companies that were founded by individuals with no previous experience in running a business. This was essential in order to see a full picture of how a complete learning process actually unfolds, without being colored by any former knowledge in business venturing.

These three criteria created restraints when searching for case companies to investigate, but also created a context in which an optimal analysis could be performed.

Due the geographical proximity of both Mjärdevi Science Park and the incubator LEAD to the university, there was still large probability of finding suitable companies. Furthermore, we established contact with a business coach who works with both the incubator and the university who assisted us in finding companies that fit our criteria and subsequently contacted them directly. Six companies fulfilled the above mentioned criteria and they were consequently contacted by email. The obtained result from sending out the initial emails was promising, most entrepreneurs behind the start-ups were interested in our research topic. After the first round of replies, LinkedIn was used to make sure that the entrepreneurs actually lacked any previous business experience. Three companies ended up suiting all of the criteria that had been set up.

In the end the companies proved to be very different as desired, yet still comparable. The three companies were founded by individuals with different levels of specialized experience within a technology subject, and thus can give a representation of how the development of managerial capability may differ depending on the amount of experience. Furthermore, the technology behind the products the start-ups provide are based on three very different levels of complexity, from a mobile app, to an area of research of which few people are familiar with.

On the other hand, all three companies were admitted into the incubator LEAD in 2012, and due to the incubation period of three years they will all graduate in early 2015. By chance, we managed to find three companies that were coached by the same business coach at LEAD. This facilitated the process of locating, and accessing all of the important actors participating in the development of the three start-ups in order to serve our purpose.
A description and the reasoning behind the choice of the start-ups in our selected sample is provided as follow:

**Kulipa**

Kulipa provides a mobile platform from where customers can pre-order food and beverages and thus avoid explosive queues that often occurs in restaurant during the busiest hours. They have also open sourced their platform and thus enable restaurant to use it as their own ordering platform as a substitute for calling in an order. Kulipa was interesting as a case company due to the fact that the founders were all students at the time of foundation. They had all studied Computer Science and Electrical Engineering during five years and can therefore be considered specialist within their study area. However, their relatively low level of experience within their specialization will provide an interesting contrast to the start-ups founded by PhDs.

**SenionLab**

SenionLab has created an indoor positioning system that allows for exact positioning inside a building, useful in for example hospitals and airports. SenionLab was founded by PhD students working at Linköping University and thus have more technical specialization than Kulipa. Furthermore, SenionLab had during the data collection 10 employees, which makes them a rather large start-up. The size of the organization was also an interesting feature that could have some effect on the knowledge processes and the case of SenionLab was therefore considered to add important aspects into the studied phenomenon.

**Graphensic**

Graphensic produces a high technology graphene on silicon carbide, a material that can be used in electronics and sensors. Graphensic was founded by three researchers at Linköping University, that during their career have published over 500 publications. Their apparent high level of expertise within their research area provided this study with a polar case to the students within Kulipa.

**2.2.3 Data Collection**

The next step in the research process was to start collecting empirical data. This was done through face-to-face interviews with individuals in the three case companies. This interview process will subsequently be described in more detail below. Some interviewees were asked some complementary questions through email afterwards.
2.2.3.1 Interviews

After identifying and contacting the three chosen case companies, it was time to collect the empirical data. The following section will thus describe the interview process.

In this research, nine semi-structured interviews were undertaken where the aim was to include all the important actors involved in the start-up. Naturally this included the founders of the start-up but also other actors that the founders perceived essential for the development that had been realized. Oftentimes, these important actors were identified in the first interviews with the founders. Since the first round of interviews was performed in early March, there was enough time to contact and meet everyone that had a crucial role for the start-ups development. The interviews were all conducted between March 10th and April 23rd 2015. The emails that were sent consisted of structured questions, where some of them aimed at filling gaps that were overlooked in the personal interview. The aim of the data collection was to make sure that information was gathered from several perspectives, both from more professional opinions of the business coaches as well as internal stories told by the founders. Therefore, it was considered important to access people involved both before the start-up, i.e. in the innovation council, InnovationskontorEtt, as well as the business coach provided for the start-up in the incubator and other involved individuals.

In Figure 3, it can be seen which individuals were interviewed in each company as well as their role in the start-up. It must be noted that the aim of the table is to present the inputs of information to every case. Some interviews provided insights to more than one case and therefore are listed more than once. The aim was to access at least two founders in each case, which was possible in all cases but Graphensic, since two of the three founders felt that they did not have time to participate in an interview. On the other hand, for Graphensic several contrasting perspectives were enabled by including the innovation counselor that supported them before foundation as well as the newly hired external CEO. As it can be seen in Figure 3, the business coach Lars Bengtsson was interviewed only once but was a highly valuable source of information regarding all three case companies. He could provide insights of the companies both from his role as business coach for Kulipa and Graphensic as well as chairman of the board for SenionLab, but also a professional account for the circumstances surrounding the process of starting a new venture. Merging the comments by Bengtsson together with what was told by the founders, allowed for a proper understanding of the development that occurred in terms of knowledge processes. The same accounts for Gio Fornell, who could contribute with understandings of how the process looked for the companies before they got admitted into LEAD, this period is however
not in focus in this thesis and thus, the information given during the interview was deemed plentiful.

<table>
<thead>
<tr>
<th>Kulipa</th>
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<tbody>
<tr>
<td><strong>Founder/CEO</strong></td>
<td>Erik Södermark</td>
</tr>
<tr>
<td><strong>Founder/CPO</strong></td>
<td>Erik Sjölander</td>
</tr>
<tr>
<td><strong>Business Coach</strong></td>
<td>Lars Bengtsson</td>
</tr>
<tr>
<td><strong>Innovation Counselor</strong></td>
<td>Gio Fornell</td>
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<th>SenionLab</th>
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<tbody>
<tr>
<td><strong>Founder/CEO</strong></td>
<td>Christian Lundquist</td>
</tr>
<tr>
<td><strong>Founder/CPO</strong></td>
<td>Jonas Callmer</td>
</tr>
<tr>
<td><strong>Chairman of the board/Business coach</strong></td>
<td>Lars Bengtsson</td>
</tr>
<tr>
<td><strong>Innovation counselor</strong></td>
<td>Gio Fornell</td>
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<tr>
<th>Graphensic</th>
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<tbody>
<tr>
<td><strong>Founder</strong></td>
<td>Mikael Syväjärvi</td>
</tr>
<tr>
<td><strong>CEO</strong></td>
<td>Amer Ali</td>
</tr>
<tr>
<td><strong>Owner and Business Consultant</strong></td>
<td>Jonas Nilsson</td>
</tr>
<tr>
<td><strong>Business Coach</strong></td>
<td>Lars Bengtsson</td>
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<tr>
<td><strong>Innovation Counselor</strong></td>
<td>Gio Fornell</td>
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</table>

*Figure 3: List of interviewees by case company*
As prescribed by Bryman and Bell (2003), interviews are one of the most common methods in qualitative research. The benefits lie foremost in its flexibility. Using ‘semi-structured interviews’ is a “trendy” expression when trying to explain how the interviews were structured. According to Bryman and Bell (2003), a semi-structured interview format gives opportunities for allowing the interviewee to “ramble”, something that can give insight to what the interviewees themselves find especially important. In this research, the semi-structure came in the form of pre-defined areas that the authors wanted to cover. The areas in focus of each interviews were adapted to the respondents depending on what role he or she has in the start-up. For the founders, the interviews were more focused on their own perception of becoming entrepreneurs, the initial struggles and how they perceived the help from the incubator. For the business coaches on the other hand, the aim was to find how they perceived the development of the start-ups and what they had identified as problems and advantages in each case. For other individuals, such as business consultants and external CEO’s, it was interesting to explore how they tried to convey their business-specific knowledge and how this was received by the founders.

As mentioned, these areas of interest were seen as loose and flexible and each interview took its own turn and in the end all of them turned out somewhat different compared to the others. Nevertheless, by having pre-defined topics of interest for each individual, we were able to cover those, as well as subjects the respondents themselves deemed important after hearing about the purpose of this research. This flexibility would become especially important in a research of this explorative nature, since it entails possibilities of uncovering aspects that were not considered beforehand.

Even though all interviewees were Swedish, in order to minimize risk connected to translation, all interviews were conducted in English. Furthermore, permission to record was asked in advanced and the interviews were later on transcribed. Unfortunately, technical problems were experienced during the very first interview with Christian Lundquist, CEO of SenionLab. Due to problems with the cellphone used for recording, only 15 minutes, out of 60 minutes, could be recorded. However, since one of the researchers took notes during the interview while the other focused on asking the questions, the information told during that interview could still be recollected and used. Hence, the interview was not ruled out even though only parts of it were recorded and transcribed. The notes taken during the interview were still deemed very valuable when analyzing.
After a few weeks in the process of data collection, concepts and situations started to become repeated by the interviewees. Between the founders in the different companies, the information obtained from the interviews turned out to be similar while the business coaches presented a uniform perspective of the case companies. It was realized that a saturation point might have been reached. An example of this is the second interview with Erik Södermark that was supposed to last for 30 minutes. Even though a different interview template had been prepared with new themes and questions, after 13 minutes information started to reoccur. It was then realized that enough data had been collected to be able to perform an analysis.

2.3 Data Analysis

The process of analyzing the data in this comparative case study was grounded on the premise of constant cross-case comparison. According to Eisenhardt (1989), building theory from case studies is a dynamic process where cross-comparison between the cases is alternated with redefinition of research purpose and going back to the field in search of new evidence. This dynamic further resulted in an empirically valid theory since the theory-building process is closely tied to what was witnessed in the cases (ibid.).

The cross-case comparison was undertaken by looking for both within-group similarities as well as intergroup-differences, as prescribed by Eisenhardt (1989). This for example led to seeing several similarities between Kulipa and SenionLab in terms of how the ease of the transition from science to business, while Graphensic was differentiated from the two. On the other hand, similarities were found between Graphensic and Kulipa when it came to knowledge flows due to their relative size resemblance. In order to be able to contrast the three cases, categories where created based on the most re-occurring concepts brought forward in the interviews. The intentions of these categories were to serve as a structure for the empirical chapter. Using these categories forced the researchers to scrutinize the cases from several different perspectives. This juxtaposition facilitated the process of seeing unique patterns in each case rather than following the initial impressions and thus generalize patterns across all cases from the very beginning (ibid). Furthermore, the data collection unveiled the importance of two phases in the development of the start-ups, which turned out to have an effect on the weighed importance of the knowledge processes between the phases. Due to this importance of temporal stages, both the empirical and analytical chapter were structured thereafter.
Since the data collection occurred during a period of six weeks, in order to not lose the ideas that emerged during the first weeks, data collection and data analysis somewhat overlapped. This approach is supported by Van Maanen (1988) who states that constant conscious reflection during the progress of the study is preferred since it gives the researcher a head-start for the analysis but also the researcher becomes more flexible in the subsequent data collection, if new clues require a deeper investigation.

2.4 Research Quality

There is a variety of notions regarding what counts as good quality work when it comes to a qualitative research (Eisenhardt, 1989). However, for this study this following section will be divided into ‘internal validity’ and ‘external validity’ where the former discusses the trustworthiness of the research and the latter deals with transferability.

2.4.1 Internal Validity.

The internal validity surrounds the trustworthiness of the research and whether the findings are believable. In order to increase the credibility of this research, the framework presented by Eisenhardt (1989) will be used, who in turn supports her work with other well-known researchers such as Miles and Huberman (1984) and Yin (1981). Their approach includes following a certain methodological consistency where using techniques such as the theoretical sampling method and the constant cross-case comparison with overlapping data collection and data analysis. Following the framework of creating theory from case studies as proposed by Eisenhardt (1989) ensures that this research reaches the required level of credibility since it has been used consistently to its design.

It can also be argued that the narrow scope of this thesis allowed the quality of the collected data to be high since the barriers of our research scope had been carefully predefined. When exploring the development of start-ups, several proximate research areas in which it may be easy to fall into both in terms of data collection and theory, such as individual cognitive learning and organizational learning, were avoided in order to be able to perform a more trustworthy analysis.

2.4.2 External Validity

Creating theory from case studies is likely to have a high level of empirical validity due to that the theory building is closely tied with the empirical findings (Eisenhardt, 1989). However, it may for the same reason create a theory that is rich in detail but narrow and idiosyncratic. Nonetheless,
the explorative nature of this study implies that generalizations are not in focus. Instead, it aims at developing an initial understanding of the relationship between a knowledge perspective and incubated start-ups.

2.5 Limitations

This section will outline the limitations of this study to set the expectations of the reader in terms of the drawbacks and weaknesses of the present thesis. These limitations could be divided into empirical and theoretical limitations.

In the account of the former, the first limitation is that the case companies were all originated in the context of Linköping University in Sweden. Moreover, they all have been incubated in LEAD business incubator. Though these similarities aid the comparative case study by isolating it from being affected by geographical and institutional arrangements, it may be considered that including different arrangements would lead to different conclusions for the purpose of this thesis that may also yield theoretical value.

Secondly, the studied start-ups represent success cases in terms of survival. Thus, the affirmation that they succeeded due to their proficiency in developing the required managerial capability has limited validity unless it is verified that companies that failed did so because of capability deficiencies. Moreover, the likeliness of survival is positively affected by the fact that they are all incubated start-ups, which prevents the results of this study to be generalizable to non-incubated start-ups. Future studies should consider this process of capability development in start-ups which development was not supported by a business incubator.

Thirdly, this study is based on a temporal construction of events that required the interviewees to provide a retrospective viewpoint of their experiences. Retrospection implies evaluating past events and situations usually under the light of values and thoughts that were acquired after their occurrence. This may result in that the authenticity of narrated past events may be affected by the narrator’s current thoughts and interpretation of those events. What follows is that the empirical data may have lost objectivity.

For the limitations regarding theoretical aspects of this study, it is worth noting that the abstract nature of knowledge imprints difficulties in mapping knowledge-related phenomena in the cases and its analysis. This is especially true in the case of tacit knowledge, since its lack of articulation impeded asking the interviewees direct questions about it and the references they made about the
topic were vague and difficult to interpret. Therefore, the risk for misinterpretation or failing to grasp the whole depth and breadth of the phenomena in focus is more significant. Moreover, the time restrictions imposed by the framework of a Master’s thesis imply that the propositions developed to explain the formation of managerial capability cannot be tested over a longer period of time to confirm their consistency.
CHAPTER 3: Theoretical Framework

This chapter aims at providing the conceptual categories that will aid the analysis of the purpose of this study. The theories used in this thesis belong to two main bodies of literature. The first one is knowledge and the knowledge perspective. This first section of this chapter will provide a review of these concepts. The rise of the importance of knowledge pushed the business science field to start theorizing about the processes that involve knowledge within organizations.

The purpose of this thesis involves the analysis of knowledge processes that lead to the development of capabilities within the nascent firm. Therefore, for the second section of this chapter the processes that are deemed as important for the purpose will be commented, namely knowledge acquisition and knowledge integration.

The second body of literature used in this thesis focuses on theoretical aspects of start-ups, the empirical field in which the purpose centers its attention. The third section of this chapter develops then the definition of start-ups and how they can be conceived in the light of the models of organizational life-cycle.

Finally, the fourth section reviews some concepts that bring both bodies of literature closer together. In this part, the concepts of knowledge requirements in new businesses, novice entrepreneurship and business incubation will be discussed.

Figure 4: The two literature streams used in this thesis
3.1 Knowledge and the Knowledge-Based View

This section aims at dissecting the notion of knowledge in order to provide the analysis of the case with workable aspects of this abstract concept. After giving a working definition and briefly discussing its implications, the concept of knowledge will be analyzed within two of the main taxonomies presented in literature.

In the second section the concept of knowledge will be presented as a company’s most valuable resource, an idea that lies in the foundation of the knowledge-based view. This knowledge perspective and the paradigm it represents will be developed in this section.

3.1.1. Definition

The broad and abstract nature of knowledge has been subject to epistemological debate since the early days of Western philosophy. As Grant (1996) argues, the matter of defining precisely what knowledge is has been discussed by early thinkers such as Plato until contemporary times without the emergence of a clear consensus on all the aspects covered by a single definition. However, there is little controversy in saying that in broad terms knowledge could be understood in three different, but co-existing ways (Nickols, 2000). Firstly, knowledge can be understood as ‘that which is known’ and that encompasses elements of ‘state of mind’ such as ‘being acquainted with’, ‘being aware of’, ‘being familiar with’, ‘understanding’ and ‘being able to explain’, among others (Machlup, 1980). This understanding of the concept of knowledge is often referred to as ‘know-about’. Secondly, the notion of knowledge can be understood also as the capacity of doing something, i.e. having an understanding of the facts, the procedures, the techniques and principles that are required to make something happen (Nickols, 2000). This is also referred to as ‘know-how’. Finally, the word ‘knowledge’ is also used to describe codified and explicit facts and information in the form of a body of knowledge articulated in books, journals, guidelines, instructions, etc. One definition that incorporates these three notions of knowledge is the one given Davenport and Prusak (1998:5). The authors argue that:

"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms."
This working definition of knowledge pinpoints the fact that knowledge as a concept is not simple or straightforward and that is composed by a mixture of diverse elements. It integrates all the three senses commonly connected to the world knowledge since it incorporates explicit information, the notion of individual ‘know-about’ and the idea of knowledge as ‘know-how’. It can be found rooted in individuals’ minds and actions, group behaviors as well as embodied and codified apart from the knowers. Moreover, by mentioning the function of knowledge as framework to incorporate new experiences and information, this definition adds an interesting and relevant fact: previous knowledge stocks will shape its future development, thus implying that knowledge is path dependent. Finally, as Alavi and Leidner (2001) argue, this definition points at the fact that knowledge is the result of cognitive processing caused by the introduction of new stimuli. The authors posit that information and experiences become knowledge when they are processed in the mind of individuals. What follows from all these statements is that for a group of individuals to arrive at the same interpretation of a given informational or experiential stimuli they must share to some extent a common knowledge base.

Conceiving knowledge in this fashion has important implications for how knowledge should be studied within organizations. This definition signals that knowledge is dynamic and flows through an organization instead of being a static resource. As a result, analyzing it in an organizational context becomes a matter of observing dynamic processes (Carlsson et al. 1996) such as knowledge creation, knowledge sharing and knowledge integration. The processes within knowledge management that are relevant for this study will be described in later sections within this chapter.

### 3.2.2 Taxonomies

From the given definition of knowledge it follows that knowledge can be articulated or not and either possessed by an individual or embedded in a social group. In this section, a taxonomy of knowledge will be further developed based on two dimensions: the epistemological and the ontological. While the former refers to the modes of expression and the process of thought behind knowledge, the latter concerns a categorization of the scope of knowledge, namely individual or collective.

**Epistemological Taxonomy: Explicit and Tacit Knowledge**

Drawing on the studies conducted by Polanyi (1958, 1966), Nonaka (1991, 1994) explained the nature of the differences between tacit and explicit knowledge and made it a central piece of his
model of knowledge creation. Explicit knowledge is that which can be articulated, codified and easily expressed in formal language. It takes the form of data, books, formulas, recipes, manuals, procedures, etc. (Nonaka, et al., 2000). Its nature makes it susceptible of easy transmission, sharing and storage (ibid).

Conversely, tacit knowledge refers in simple terms to those things that are known but which are hard to articulate or explain verbally or symbolically, such as hunches and intuition. The tacit dimension of knowledge is highly personal, deeply rooted in action, experience, emotion, ideals and values and encompasses both cognitive and technical elements (Nonaka, 1994). While the cognitive side encompasses individual’s beliefs, paradigms and mindsets, the technical elements refer to concrete know-how and skills in specific fields and contexts (ibid). Unlike explicit knowledge, the obscure and oftentimes space and time specific nature of tacit knowledge makes it harder to share, acquire and store. According to Nonaka et al. (2000), the only way of doing so is by experience and strong social interaction.

The main differences between these two expressions of knowledge are summarized in Figure 5.

<table>
<thead>
<tr>
<th></th>
<th>Explicit knowledge</th>
<th>Tacit knowledge</th>
</tr>
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<tbody>
<tr>
<td>Storage</td>
<td>In the ‘objective world’</td>
<td>In the ‘knowing subject’</td>
</tr>
<tr>
<td>Transfer</td>
<td>Easily communicated and transferred across time and space independently of the</td>
<td>Difficult to communicate and transfer. Requires the ‘knowing subject’ and close</td>
</tr>
<tr>
<td></td>
<td>subjects.</td>
<td>interaction. Contextual time and space are crucial.</td>
</tr>
<tr>
<td>Acquisition and</td>
<td>Through deduction or formal study</td>
<td>Through practical experience in a relevant context, i.e learn-by-doing, and</td>
</tr>
<tr>
<td>accumulation</td>
<td></td>
<td>through interaction with ‘knowing subjects’. Degree of involvement of the learning subject is crucial.</td>
</tr>
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</table>

*Figure 5: Critical differences between explicit and tacit knowledge (based on Lam, 2000)*

While it is possible to see a very clear set of differences between the concepts that form two separate systems of cognition, they do not act independently in practice. Nonaka et al. (2000) posit that tacit knowledge is the precedent of any explicit knowledge. For example, articulating verbally a concept would be impossible without the previous development of internal speech. According to the authors, this is a strong argument against the traditional Western view of knowledge which exalts the value of explicit knowledge. Marr (2005) claims that clear evidence of the fact that tacit knowledge underlies a behavior or an action is seen in situations when the explicit explanation of an action is not sufficient for someone else to behave or perform in the
same way. Our cognitive process mediate between facts and behaviors and facts alone do not capture entirely our perceptions. This is elucidated by the fact that actions occur in an ill-formed world where individuals’ understanding and behaviors are subject to bounded rationality and thus, are not able to see and interpret all the phenomena working behind a certain event. The author describes this with the example of an expert downhill skier explaining a beginner how to do slalom skiing. This is most likely not sufficient since it is not possible for the novice skier to identify all of the processes by which the expert ‘reads’ the hill. What Marr (2005) intends to contribute to the study of knowledge is the idea that even when explicit knowledge is available, proficient performance of actions entail tacit knowledge that requires experience and action to be developed within the individual. Thus, as Nonaka et al. (2000:8) argue, “explicit knowledge without tacit insight quickly loses its meaning” so both types of knowledge are complementary. The value of this epistemological distinction of knowledge is its emphasis on the tacit dimension as the origin of all human knowledge and the focus on the social and interactive nature of learning (Lam, 2000).

However, this does not imply that explicit knowledge lacks worth. On the contrary, the ease of sharing explicit knowledge is on the foundation of the information era (Smith, 2001). It is a facilitator and accelerator of the learning process and it yields great value for organizations since it allows the reproduction of ideas and its reuse in a multitude of different problems and contexts (ibid).

Ontological Taxonomy: Individual and Organizational Knowledge

As the chosen definition of knowledge pinpoints, knowledge within an organization can be found residing in individuals and in the collective actions of the members of the organization. This characteristic of knowledge is recognized by the greatest scholars in the field of knowledge and business, such as Kogut and Zander (1992), Grant (1996), Spender (1996a) and Nonaka (1994). The distinction is made necessary by the fact that organizations and individuals are clearly not functionally equivalent and they are not capable of performing the same activities. For example, crowd behavior shows that individuals acting collectively behave in a different way than how they would have behaved individually (Spender, 1996b).

Individual knowledge is that part of the organizational knowledge that resides within the mind and skills of the individual, who “owns” it and has the autonomy to apply it regardless of the situation or context (Lam, 2000). Given the bounded rationality proposed by Simon (1957),
individuals have a limited cognitive capacity to store and process knowledge. Thus, individuals create and own knowledge that tends to be specific and specialized within a field (ibid). Given its embodiment in the person, individual knowledge moves together with the individual and thus, disappears from the organization if the person is not present. Far from being static, individual knowledge is in constant evolution. Cecez-Kecmanovic et al. (2003) argue that by being involved in particular processes and work practices, by participating in on-the-job trainings and by interacting with colleagues, the individual members of an organization go through new experiences, face problems and makes sense of them, which frequently triggers revisiting and updating their personal knowledge.

Organizational knowledge is embedded in and carried through multiple entities including organization culture and identity, routines, policies, systems, and documents. It is created and inherent in the collective actions of the organizational members as a group (Spender, 1992, 1996b). Unlike individual knowledge, it does not reside within but between and among individuals (Cecez-Kecmanovic et al., 2003). Moreover, opposite to the specialization of the individual knowledge, organizational knowledge is a generalization of meaning that allows to create a common ground for the conjoint action of the individuals (Tsoukas and Vladimirou, 2001). For example, procedures, routines and culture explain this characteristic. The value in it, is that it entails a general agreement on how things are done and interpreted within an organization which allows to coordinate the specialized and distinct individual knowledge of the organizational members (Bhatt, 2002).

As Bhatt (2002) argues, individual knowledge and organizational knowledge are distinct yet interdependent. As the adopted definition of knowledge points out, the individuals are the origin and the appliers of knowledge. This does not imply that organizational knowledge cannot exist, but instead, as Tsoukas and Vladimirou (2001) propose, that organizational knowledge is individual knowledge that became collective. “Personal knowledge becomes organizational when [...] individuals draw and act upon a corpus of generalizations in the form of generic rules produced by the organization.” (Tsoukas and Vladimirou, 2001:979).

### 3.1.3 The Knowledge-Based View

The source of organizational performance has been a predominant topic in the business science. Researchers have wondered how an organization is able to achieve competitive advantages and consequently how to design the best strategies accordingly. During the 80s two main paradigms
in this field emerged: the market competitive forces approach (Porter, 1980, 1985, 1986, 1987) and the resource-based perspective (Wernerfelt, 1984; Barney, 1991). While on the former, the source of competitive advantage is to be found in the external environment by creating privileged market positions, in the latter competitiveness is generated from within depending on the nature of an organization’s resources. Seemingly conflicting ideas, in reality these two paradigms co-exist and are believed to be complementary, ‘two sides of the same coin’ (Wernerfelt, 1984:1). In this thesis, the focus will be set in the internal aspects of the firm as a source of performance. More specifically, knowledge will be considered as the most important resource in this matter.

Even when the founding idea of viewing a firm as a bundle of resources was posited by Penrose in 1959, it was in 1984 when Wernerfelt coined the name of the new paradigm in business: the resource-based view – hereafter RBV. This perspective suggests that competitive advantage is determined by firm-specific resources that are costly to copy by other competitors (Barney, 1986a, 1986b, 1991; Wernerfelt, 1984). According to Barney (1991), these resources are physical and financial assets, capabilities, organizational processes, information, and knowledge, among others. In order to yield sustainable competitive advantage this resources need to possess some special qualities. They have to be valuable, rare, imperfectly imitable and non-substitutable (reduced in an acronym as VRIN) (Barney 1991). Possessing and accumulating VRIN resources will determine a firm’s capacity to generate profit (Amit and Schoemaker, 1993).

However, in more recent years the literature in the field has noted that not every resource is equally susceptible of yielding competitive advantages, favoring intangible resources and capabilities as the source of profitability. “Since the origin of all tangible resources lies outside the firm, it follows that competitive advantage is more likely to arise from the intangible firm-specific knowledge which enables it to add value to the incoming factors of production in a relatively unique manner” (Spender, 1996:46). In this sense, Penrose (1959) argued that physical assets generate value provided that the management knows how to combine them in order to do so. The services rendered by a given bundle of tangible resources is dependent upon how they are combined and applied, which in turn depends on what is known about them. She further claimed that acquiring or generating new knowledge has the potential to uncover new ways of exploiting the current resources and thus, generate organizational growth. Since there is a strong link between the knowledge that the individuals in the organization have and the value that can be obtained from the resources, it can be argued that firms are actually repositories of knowledge (ibid).
These ideas led Grant (1996) to start theorizing about a fine-tuned version of the RBV: the knowledge-based view – hereafter referred as KBV. The KBV argues that a firm’s ability to perform originates from the nature of its knowledge resources, which are the single most important strategic resource of a firm’s portfolio. Knowledge is considered to have a determinant role in a firm’s competitive success and thus, differences in performance between organizations are a consequence of knowledge asymmetries (Kogut & Zander, 1992; Nonaka, 1994).

The emergence and consolidation of this new perspective is explained by the changes in the economic context experienced since the late 90s until present days. The world is going through a structural change in the productive paradigm. In an age of increasing globalization and increasing pace of change, the inputs and tools that once were the sources of competitive advantage are becoming more mobile and thus going through a process of commoditization (Friedman, 2006). In order to compete successfully in this fast-changing environment firms and academics in the business field started to look into the current pattern of wealth creation. Sirois (1999) characterized this new scenario by describing the ‘innovation triangle’, composed by the (i) increasing power of transport and telecommunications accelerating globalization, (ii) the broader knowledge that is now accessible and (iii) the evolution of IT. This new knowledge-based economy is the result of a world where most of the important actors and variables which are crucial to business change rapidly, making continuous innovation and the knowledge that enables such innovation become important sources of sustainable competitive advantage and economic power (Nonaka, Toyama and Konno, 2000). Therefore, the new emerging paradigm is based on the belief that in the 21st century, the success of a company will be based on the possession, exploitation and development of knowledge which is socially complex and difficult to imitate (Ichijo and Nonaka, 2006). The evidence lies in the fact that knowledge-based assets are becoming proportionally more important in organizational resource bases (Stewart, 1997; Roos et al., 1997).

Therefore, the KBV of the firm is the logical next step of development of the RBV since it incorporates the dynamic evolution of its resources to sustain competitive advantage in a changing environment (Helfat and Peteraf, 2003). Learning quickly in order to reconfigure resources according to market changes becomes critical to performance (Eisenhardt and Santos, 2002). Thus, superior knowledge bases, originated in more effective organizational learning, lead to superior organizational performance through higher flexibility and faster reaction (Senge, 1990).
A novel contribution to the KBV was done by Spender (1996a, 1996b). This author disagreed in that the KBV is a mere extension of the RBV since knowledge is intrinsically different from all other resources that are objectively transferable and that it is not just a matter of hierarchy. Unlike other resources, knowledge lies within individuals and any given person in the organization cannot possess all the knowledge available in the firm. Knowledge is meaning which is shaped by the cognitive and emotive characteristics of a person. This is why Spender was the first author to start identifying knowledge as an individual phenomenon and organizations as systems of knowledge.

Together with Grant and Spender, another pair of authors that made a notable contribution to the KBV are Kogut and Zander (1992, 1996). In line with Spender’s theories, these authors argued that “a firm can be understood as a social community specializing in the speed and efficiency in the creation and transfer of knowledge” (Kogut and Zander, 1996: 503) and that business firms exist because they are able to create, transfer, transform and organize knowledge better than their competitors and thus are creating competitive advantages (Kogut and Zander, 1992).

The individual nature of knowledge recognized by Spender, together with the collective knowledge function of the organization suggested by Kogut and Zander lead the discussion to the field of knowledge integration proposed by Grant (1996a, 1996b). This topic will be discussed in depth in the following section.

3.2 Knowledge Processes

The recent interest in organizational knowledge has prompted the issue of dissecting the knowledge flows and processes that may be found within an organization. Knowledge, as any other resource, needs to be acquired, created, transferred, stored, shared, and exploited in order to yield value. Literature has identified several processes in this matter, but for the purpose of this thesis only two will be commented and developed in this chapter. The first one is knowledge acquisition, as it describes how the entrepreneur gains access to business knowledge that they previously lacked. The process of learning and acquiring knowledge in a new field leads to specialization of some of the individuals within the founding group, which leads this research to the topic of knowledge integration. This knowledge process will be thus also developed in this section.
3.2.1 Knowledge Acquisition

In simple terms, knowledge acquisition can be referred to as the means of gathering knowledge (Huber, 1991). The process of knowledge acquisition can take both a formal form, for example through customer surveys and more informal e.g. by listening to the morning news in order to update yourself with the latest events. Generally, knowledge acquisition can be categorized as a sub-process of organizational learning that facilitates venture growth by adding new knowledge assets (Casillas et al. 2015). It may further enhance the firm’s ability to exploit new productive opportunities (Penrose, 1959)

The importance of utilizing external knowledge is recognized in academia. Johanson and Vahlne (2009) suggest that experiential knowledge indeed can be combined with other sources and acquisition types. Huber (1991) was one of the earlier names that discussed knowledge acquisition and distinguished between five different types of processes from which an organization can acquire knowledge;

1. **Congenital knowledge** - What can be referred to as “inherited knowledge” or individual knowledge stock. As pointed out by Huber (1991) neither organizations nor individuals begin their life with a completely clean slate. The congenital knowledge is thus comprised of already rationalized concepts of the new start-ups initial environment and of the processes the organization can utilize in order to start the operations. Following the line of argument as proposed by Grant (1996b), the knowledge that is acquired and used in an organization is essentially that which has been learned and stored in the individuals behind the start-up. Thus, the nature of an organization is to a great extent influenced by the nature of its founders (Huber, 1991) which in turn will affect how the founders manages the organization during the first years.

2. **Experiential learning** – This process of knowledge acquisition or learning is the most common in the early days after foundation of the start-up. It is the process of acquiring knowledge through the personal experience with a phenomenon. Often this learning is a result of unintentional unsystematic efforts, on a “need-to” basis during the real time challenges the start-up is going through. The process of experiential knowledge acquisition is enhanced by the availability of feedback that confirms the cause-effect relationships for the learner. Moreover, cohesion and strong bonds among the organizational members also reinforce the process of learning from experience since it
allows for double-loop learning were the interaction between individual aids the group to re-interpret old beliefs and information.

3. Vicarious learning – It refers to the process of “acquiring second-hand experience” (Huber, 1991:96), meaning that firms typically try to learn about the strategies, practices, and technologies of other firms.

4. Grafting - Simon (1991:125) suggests that organizations learn in only two ways “(a) by the learning of its members, or (b) by ingesting new members who have knowledge the organization didn’t previously have”. Hiring or grafting on new individuals who possess knowledge currently not available in the organization is a process of ‘grafting’.

5. Searching and noticing - This process includes scanning the organizations’ environment for signs of change, implementing a focused search in a narrow segment as a response to a suspected problem or opportunity, assessing their performance in terms of own standards as well as the expectations from external stakeholders.

After this run-through, it is possible to establish that the concept of knowledge acquisition is extensive and multifaceted. However, utilizing the advantages associated with knowledge acquisition is important, especially in technology-intensive firms since the high-tech sector tends to require continuous exploitation and regeneration of knowledge (Lane and Lubatkin, 1998). Since young start-ups often have scarce resources, innovatively combining their own firm-specific knowledge stocks with external knowledge sources, may be the solution for growth (McDougall et al., 1994).

3.2.2 Knowledge Integration

According to Grant (1996a) individuals’ specialized knowledge is the foundation of the firm. He defines specialization as having expertise in a particular disciplinary domain. Grant (1996b) claims that given that the human brain has cognitive limits, individual knowledge is acquired and stored in a highly specialized form. This implies that there is a trade-off between depth and breadth of knowledge. As early as 1776, the economic importance of specialization was recognized by Adam Smith in his classic book An Inquiry into the Nature and Causes of the Wealth of Nations. 239 years after, we witness how the pressures of an increasingly competitive environment that impose the need for constant innovation have pushed the necessity and scope of specialization even
The specialization within a narrow field is required to be able to discover the unknown and to learn how to master that field of specialization (Schmickl and Kieser, 2008).

Nevertheless, it is not efficient nor cognitively possible for an individual to learn all the knowledge required for a firm to deliver a product or a service to the market. When thinking about an organization, its productive activity requires a diversity of knowledge which needs to be combined to be able to perform collectively (Grant, 1996b). Different domains of knowledge need to be articulated synergistically to reach new and higher levels of knowledge that lead to new products and concepts. This statement led Grant (1996a) to theorize that if (i) knowledge is a critical input to every activity the firm performs, (ii) efficiency and cognitive limits require that knowledge is stored by the individuals in specialized form and (iii) production demands many types of specialized knowledge, then it is possible to claim that the primary role of the firm is knowledge integration.

Knowledge integration can be defined as an on-going collective process of constructing, articulating, and redefining shared beliefs through the social interaction of organizational members (Huang et al., 2001). Furthermore, knowledge integration is the “organizational process through which firms access and utilize the knowledge possessed by its members” (Grant 1996a:112-113). The tension between the need for differentiation and for integration lies thus at the heart of the study of organizations. However, the process of integrating knowledge is far from being simple and unequivocal.

The task of an organization is to coordinate the efforts of these specialists, a task that can prove to be difficult (Grant 1996a). Sicotte and Langley (2000) state that integrating expertise tends to be hampered by the development of distinct “thought worlds” associated with individual specialization. This generates a scenario where it could be difficult for specialists in different domains to find a common language. According to Bechky (2003), problems arise when different specialists look upon one project in different ways. This can lead to lack of communication, and as a result misunderstandings between different specialists can arise. Carlisle (2004) discusses the problems related to managing knowledge across boundaries. According to the author, there are three types of boundaries:

1. **Syntactic boundary** - One that can hinder the process of information-processing but that can be dealt with in a straightforward manner because a common language and a common interest is shared between the sender and the receiver.
2. **Semantic boundary** – It recognizes that problems of interpretation exist because the contexts in which people develop their knowledge differ and thus the language between the sender and receiver may differ in some meanings. It implies interpretive differences in what a word, measurement, or outcome means.

3. **Pragmatic boundary** - It entails a semantic boundary with the difference that the involved actors have in addition different interests. “When interests are in conflict, the knowledge developed in one domain generates negative consequences in another” (Carlisle, 2004:559). This kind of boundary is the biggest barrier to knowledge integration.

Mechanisms to cope with the above mentioned problems will be described after the following section.

**Organizational Capabilities**

According to Grant (1996b), competitive advantage cannot come from the knowledge per se, but from how it is integrated to form capabilities. For example, a football dream-team composed by the biggest stars will not succeed if they are not able to play together. Grant (1996b) argues that integrating specialists’ knowledge to perform a discrete task is at the core of organizational capabilities. The author defines organizational capability as an organization’s capacity to perform repeatedly a productive task which relates either directly or indirectly to a firm’s capacity for creating value through effecting the transformation of inputs into outputs. Every action performed by a firm is enabled by a certain organizational capability, which resulted from the integration specialist knowledge bases of a number of individuals (ibid). For example, a marketing campaign would not be possible without the designer that created the visuals, the marketer that designed the channels, the engineer that developed the product, etc.

Grant (1996b) further argues that the integration of knowledge into organizational capabilities is hierarchical, in the sense that in the base of the process lies the specialized knowledge held by individuals. In the first level of integration, that knowledge is combined to perform specific and specialized tasks, which further on are integrated into broader functional capabilities, such as research, marketing or finance. This is what the author calls the architecture of capabilities. By this staged process is how knowledge goes from the individual mind to the collective level. The broader the knowledge being integrated, the harder is to develop an organizational capability since the grounding individual specialized knowledge lays further away in the hierarchy chain (ibid). What Grants (1996b) argues is that in order to be able to develop and perform such
overarching organizational capabilities, the architecture of capabilities needs to correspond to the organizational structure of authority, communication and decision making.

Figure 6: Hierarchies of knowledge integration (based on Grant, 1996b)

Mechanisms to Integrate Knowledge into Organizational Capabilities

As mentioned before, Grant (1996a, 1996b) posits that coordinating the specialists’ knowledge to integrate it and form capabilities is the biggest challenge for a company. The author described a series of mechanisms that support the integration of knowledge:

1. **Rules and directives**: It involves codifying tacit knowledge into explicit instructions such as policies, codes of conduct, plans and budget. It is the most efficient mechanism since it allows the coordination of big groups and multiple activities. However, it implies knowledge losses since not all knowledge is susceptible of codification.

2. **Organizational routines**: They are a platform for the coordination of complex patterns of interaction. They support the coordination of actions based on tacit knowledge understandings and do not depend on the communication of explicit knowledge. Enberg, Lindkvist and Tell (2006), describe how intensive face-to-face interaction is not always needed in order to integrate knowledge. Relying on tacit routines that decrease the need for meetings and allow more individual work is also a more efficient way of integrating
knowledge. Similarly, Ratcheva (2008) also pinpoints that routines and work practices are important for successful knowledge integration.

3. **Sequencing**: Organizational activity is organized in a time-patterned sequence and aims at integrating knowledge in functional steps. The lack of communication between the individuals holding diverse specialized knowledge in each step makes this mechanisms not so effective in integrating knowledge.

4. **Group problem solving and decision making**: Unlike the previously listed mechanisms which seek to economize the costs of communication and learning, this mechanism is based on personal and frequent communication and interaction. This mechanism becomes more necessary in complex and uncertain environments, such as crisis and breakthrough innovation products. However, in terms of efficiency this mechanism’s consensus decision making implies the highest efficiency costs given the difficulties in communicating tacit knowledge.

**Knowledge Integration Success Factors**

Grant (1996b) described that the attributes that lead to an effective knowledge integration are found in three dimensions: efficiency of integration, scope of integration and flexibility of integration.

- **Efficiency of integration** – It describes the ability of an organization to access and utilize the specialized knowledge that lies within its organizational members. It is reflected in the minimization of costs of communication and interaction. Efficiency is determined by three factors:
  - **Level of common knowledge**: Direction, routines and group decision making require communication between individuals. And communication prerequisites that the actors involved share a common language in order to share meaning. In order to integrate specialized knowledge that is not common to all individuals involved, some of it needs to be reduced into common terms in order to be communicated. This implies a knowledge loss, and the size of the loss will be determined by the dimension of the shared common knowledge. Common knowledge encompasses basic platforms as a common language, as well as more sophisticated areas such as common meanings and interpretation, shared specific knowledge and shared values and symbols.
3.3. Business Start-ups in the Organizational Life Cycle

In this section, the discussion will depart from the knowledge-based theory and introduce the field in which the purpose focuses, namely the context of start-ups. Firstly, a definition of start-up will be outlined striving to encompass all the relevant features of this special kind of venture. Secondly, an overview of models of organizational life cycles will be outlined, which will provide a temporal framework for the development of an organization as well as significant characteristics of each stage of development.

3.3.1 Definition

Entrepreneurship is commonly associated with the event of new business creation (Gartner, 1985). As the name indicates, start-up businesses reference a newly started business in its early stages. Starting a restaurant is a new business. Founding a semi-conductor manufacturer is a new business. Developing and commercializing a computer game is a new business. However, are they all what entrepreneurs understand by start-up businesses? Based on the available hands-on guides for entrepreneurs, entrepreneurship magazines and venture capitalists the answer to that question

- Frequency and variability of task performance: Using routines as an integration mechanism is less efficient when there is a great variation of the routine which is required in response to a variation in the environment. In these context, mechanisms that require more interaction are more suitable.
- Structure: Its design must respond to the demand of organizing activities in a manner that reduces the extent and intensity of the communication needed to integrate knowledge, e.g. hierarchical bureaucracy if the integration mechanisms are based on rules and direction.

- Scope of integration - The larger the span and breadth of specialized knowledge that organizational capabilities draws upon the more likely it is to develop competitive capabilities. This is due to the fact that these capabilities will be harder to imitate by competitors and that the specialized knowledge is likely to be complementary.

- Flexibility of integration – The forces of innovative competition forces companies to integrate new domains of knowledge and develop new capabilities. Therefore, flexibility of integration encompasses the ability of a firm to assimilate additional types of knowledge and reconfigure existing knowledge into new capabilities.

would be “no”. Surprisingly enough, even when much has been written about emerging businesses, literature does not provide a structured definition of what a start-up is, one that encompasses its main characteristics and clear parameters to differentiate what it is and what it is not a start-up venture. In this section, three of the most cited definitions will be listed in Figure 7 in order to reassemble the main features attributed to the general understanding of the concept of start-up business.

From the definitions shown in Figure 7, the main characteristics that define a start-up could be drawn:

- **Innovative idea / new product or service** – As Timmons and Spinelli (1994) express, a start-up is the raw expression of entrepreneurship, a concept which has been closely linked to innovation as early as 1911, by Schumpeter. Entrepreneurship orbits around the identification of new opportunities and the pursuit of those opportunities through the development of novel product and services (Venkataraman, 1997). “The large companies invest in incremental technologies that have more controllable risks—and predictable returns. By contrast, start-ups invest in breakthrough innovation” (Cohan, 2012:10). In the very conception of the start-up we find the original idea which is the result of an intended effort to create new knowledge through research, experimentation or prototype development which then is appropriated through its commercialization (Warsh, 2006). In an aggregate level, start-ups’ innovativeness is broadly recognized as a driving force behind economic growth (i.e Braunerhjelm, 2008; Acs et al., 2012; Audretsch et al., 2005; Carree and Thurik, 2003; Acs, 2006)

- **High growth** – Graham (2012) argues that fast growth is the only single thing that distinguishes a start-up from any other kind of newly founded enterprise. Start-ups are designed to grow fast. All companies aspire to grow to some degree, but unlike established firms which have already achieved a level of viability, start-ups need to swiftly grow to overcome the disadvantages associated with being a new player in the market in order to survive (Brüderl et al., 1992). Moreover, Gundry and Welsch (2001) argue that
the ambition to growth is a good measurement of the intensity of entrepreneurship within an organization. It follows that, if start-ups are the ultimate expression and archetype of entrepreneurship, a strong ambition to grow is inherent to them.

- **Extreme uncertainty** – Ries (2011) considers uncertainty to be an essential part of what a start-up is. Start-ups confront innovation and an emergent business in situations where crucial aspects are unclear, such as who the customers are or what they really want, what is the organization’s competitive advantage, how the competitors behave or if this new technology will ever be adopted by users. “To open up a new business that is an exact clone of an existing business all the way down to the business model, pricing, target customer, and product may be an attractive economic investment, but it is not a start-up because its success depends only on execution” (Ries, 2011:28-29). Uncertainty is a measure of ignorance, an inability to answer the questions that must be asked to reduce risk (Julien, 2008). Therefore, when new businesses pursue uncharted waters based on new discoveries and innovations with the intent of attaining considerable growth, risk is an inexorable reality (Busenitz, 1999). The high risk that start-ups entail makes the access to resources (financial, material and immaterial) much harder, increasing the uncertainty of their environment (ibid).

- **Institution** – As Ries (2011) posits, entrepreneurship is management and not just the product development. It is the process of building a business independently of the nature of the service or product that the new business will provide. The author argues that in the world of start-ups, in the midst of excitement and chaos of new technologies the entrepreneurs tend to forget that building a start-up is a process of structured and organized institution building. This is what the author recognizes to be one of the main reasons for ventures to fail since “it may seem counterintuitive to think that something as disruptive, innovative, and chaotic as a start-up can be managed or, to be accurate, must be managed” (Ries, 2011:10).

- **Search** - The high growth listed above as crucial for survival is not usually witnessed immediately after the creation of the company, but instead it is preceded by periods of searching in the ambiguous setting what the market needs and wants and how to deliver it (Graham, 2012). Furthermore, Blank (2013) claims that this search is what separates start-ups from mature companies. In the uncertain field in which start-ups work, the ideal of having a long-term fixated business plan is a fallacy only valued by venture capitalists. This misconception assumes that it is possible to know most of the variables of the
business in advance. Most of the start-ups that survive show a pattern of behavior in which they succeed by iteratively adjusting the plan from failure to failure and improving their original ideas as they learn from their customers (ibid). “One of the critical differences is that while existing companies execute a business model, start-ups look for one” (Blank, 2013:67).

- **Scalable business model** – Scalability is defined as “how well the organization’s processes and structures work when the output of the organization increases, often by several orders of magnitude in a short time period” (Bergin, 2001:1). It implies being able to increase rapidly the volume of activity without significant cost increments. Given that scarcity of resources of all sorts is broadly recognized in literature as an issue that all start-ups face (i.e Baker and Nelson, 2005; Ries, 2011; Venkataraman, 1997; Terpstra and Olson, 1993; Bruton and Rubanik, 2002; Weiblen and Chesbrough, 2015) together with the fact that the desired outcome is rapid growth, the start-up should aim at designing a scalable business model in which exploiting increasing volumes of opportunities is not hindered by scarce resources. Therefore, a start-up is not only defined by its size and novelty, but also by the agility given by its ability to efficiently and effectively exploit emerging business opportunities (Nguyen, 2014).

All in all, even when a start-up is a new business, not every new business is a start-up. Qualifying as a start-up requires a different approach to growth. Instead of being driven by profitability and stability, the focus is on growth potential which involves a search for a scalable business model that allows the company to grow fast from scarce resources. Moreover, the product or service on which the business model is based is innovative and creative, adding risk and uncertainty to the start-up profile. In other words, a start-up is a risky new venture which intends to become a large institution through disrupting the market with innovative products or services.

### 3.3.2 Growth Stages: Organizational Life Cycle Model

Firms’ development is usually explained in literature with the organizational life cycle paradigm. Borrowing the concept from biological sciences, many researchers have proposed models that describe the path of an enterprise from birth to death (i.e. Chandler, 1962; Galbraith, 1982; Adizes, 1989; Dodge and Robbins, 1992; Hanks, Watson, Jensen and Chandler, 1993; Garnsey, 1998; Lester, Parnell and Carraher, 2003). These scholars believe that an organization, just as a human being, have predictable patterns of sequential and progressive behavior that are associated with each stage of an organization’s life. Following the founding work of Chandler (1962),
academics agree on that enterprises develop patterns of organization structure in response to common growth and market challenges. Even when the life cycle paradigm is well established, these studies are not consistent with each other in terms of what constitutes a stage, the number of stages and the structural characteristics of each stage. However, in spite of this great variance, Hanks et al. (1993) compared all the most relevant models and found that all of them present a fairly consistent pattern of organizational evolution. Based on that comparison, they summarized the common elements they found and developed a 5-stage life cycle model, reproduced in Figure 8, that encompass the fundamentals that that exhibit some general agreement among scholars.

<table>
<thead>
<tr>
<th>Start-up</th>
<th>Expansion</th>
<th>Consolidation</th>
<th>Diversification</th>
<th>Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Young</td>
<td>........</td>
<td>Older</td>
<td>Any age</td>
</tr>
<tr>
<td>Size</td>
<td>Small</td>
<td>Large</td>
<td>Larger</td>
<td>Declining</td>
</tr>
<tr>
<td>Growth rate</td>
<td>Inconsistent</td>
<td>Rapid positive</td>
<td>Slow growth</td>
<td>Rapid positive</td>
</tr>
<tr>
<td>Structural form</td>
<td>Undifferentiated, simple</td>
<td>Departmentalized, functional</td>
<td>Departmentalized, functional</td>
<td>Divisional</td>
</tr>
<tr>
<td>Formalization</td>
<td>Very informal, personal, flexible, few policies</td>
<td>Formal systems emerge, but enforcement is lax</td>
<td>Formal, bureaucratic; planning and control systems are enforced</td>
<td>Formal, bureaucratic</td>
</tr>
<tr>
<td>Centralization</td>
<td>Centralized in founders</td>
<td>Centralized, limited delegation</td>
<td>Moderately centralized</td>
<td>Decentralized</td>
</tr>
<tr>
<td>Business Tasks</td>
<td>Identify niche; obtain resources; Build prototype; Set up task structure</td>
<td>Volume production and distribution; Capacity expansion; set up operating systems</td>
<td>Make business profitable; expense control; establish management systems</td>
<td>Diversification; expansion of product market scope</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Diversification</td>
<td>Revitalization; Redefinition of mission and strategy</td>
</tr>
</tbody>
</table>

*Figure 8: Life cycle stage characteristics: Common patterns (Hanks et al., 1993:12)*

The authors call the first stage ‘start-up stage’. Since the developed model is applicable to companies in general, independently of their particular characteristics, the use of the concept of ‘start-up’ in this context is related to the setting in motion of something new and thus valid to every new business. Therefore it is not equivalent to the concept of ‘start-up business’ outlined in the previous section.

As the authors pinpoint, the term ‘organizational life cycles’ is used in literature interchangeably with the terms ‘growth stages’, the latter pointing at the fact that growth is the central driver and variable that pushes the business through the different stages. The growth rates are measured traditionally in terms of the volumes of sales (i.e. Chandler, 1962; Galbraith, 1982; Adizes, 1989; Hanks, Watson, Jensen and Chandler, 1993; Garnsey, 1998; Lester, Parnell and Carraher, 2003) and some studies include the number of employees as well (Hanks et al., 1993). The evolution of the growth rate established in Figure 8 can be graphically represented in a timeline as shown in Figure 9.
As Chandler (1962) explains, organizations develop patterns of organizational structure in response to common growth and market challenges. Each stage is characterized by internal and external challenges that need to be addressed by managers. High technology companies tend to be more volatile and go through the stages faster than other types of companies (Greiner, 1972), which makes piloting the organization through its stages of development more challenging for its management (Hanks et al., 1993). Moreover, Galbraith (1982) and Meyer et al. (1988) even argue that high-tech new venture survival is compromised by the fact that its founders are usually unprepared to manage growth-related transitions effectively.

![Figure 9: Growth through life-cycle stages](image)

### 3.4 Knowledge and Business Start-ups

This section aims at bringing the knowledge body of literature closer to the field of start-ups and entrepreneurship. The founders’ knowledge will determine which opportunities they will explore, pursue, and continue in the presence of uncertainty (Minniti and Bygrave, 2001). However, entrepreneurship is a field of research that has not been particularly well studied in relation to knowledge and learning (Rae & Carswell, 2001; Ravasi, Turati, Marchisio, & Ruta, 2004). Therefore, this section will not be a compilation of well-developed theories describing the process of knowledge and capability development in start-ups but a comment on topics that will later on aid in the theoretical analysis of capability development in the empirical cases. The starting point is that if a knowledge perspective on start-ups is to be adopted, the focus needs to be in the knowledge context of the new enterprise as well as the knowledge that is required to initiate, develop and profit of innovative opportunities. In these terms, the section begins with a description
of the knowledge requirements of a start-up. That topic is followed by a comment about novice entrepreneurs, given that their lack of experience implies greater deficiencies in terms of knowledge. Finally, the role of business incubators will be discussed.

3.4.1 Knowledge Requirements

When studying topics related to entrepreneurship, an author whose grounding work on the field cannot be overlooked is Schumpeter, who theorized about the crucial role of entrepreneurs in economic growth. The author argued that “the inventor produces ideas, the entrepreneur ‘gets things done’” (Schumpeter, 1947:149). What this suggests is that advanced technological knowledge in the form of a product is not enough to become an entrepreneur. “Getting things done”, as Schumpeter expresses, corresponds to Ries’ theory about The Lean Start-up (2011), in which the author argues that the fundamental goal of entrepreneurship is to engage in organization building under conditions of extreme uncertainty. Therefore, it can be argued that starting a new venture requires the technical knowledge that lies behind an innovative product as well as the knowledge required to build a company around the product.

McKelvey and Heidemann Lassen (2013) explain these knowledge requirements by describing the three types of knowledge in which start-ups rely on as shown in Figure 10.

<table>
<thead>
<tr>
<th>Scientific and technological knowledge</th>
<th>Market knowledge</th>
<th>Business knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learned as result of many years of study and powered by a creative force to develop technical solutions and products</td>
<td>Information gathered from competitors, past and current customers and the market as well as ideas about pricing and the future customer needs</td>
<td>Related to running the company. Internally, it implies organizational design, structure and management. Externally, it regards networks and regulations compliance</td>
</tr>
</tbody>
</table>

Figure 10: Types of knowledge required by a start-up (McKelvey and Heidemann Lassen, 2013:21-22)

For the sake of simplicity and relevance, what it is called business knowledge in this thesis could be defined as a combination of what these authors call market knowledge and business knowledge. It is a blend between external and internal issues related to the business side of the firm that aim at building an institution that will commercialize a technological invention. Furthermore, McKelvey and Heidemann Lassen (2013) claim that unlike scientific and technological knowledge, much of the market and business knowledge cannot be codified as laws and principles. Since these kinds of knowledge have to do with facing uncertainty and risks, trying solutions that are likely to work and finding new ways of solving old problems it is usually learned through experience and has to do both with “knowing” and “doing” business (McKelvey and
Heidemann Lassen, 2013:22). Ries (2011:38) explains this by saying that “we must learn the truth about which elements of our strategy are working to realize our vision and which are just crazy. We must learn what customers really want, not what they say they want or what we think they should want. We must discover whether we are on a path that will lead to growing a sustainable business”.

The role of experience in obtaining market and business knowledge has been broadly commented in literature. Likewise Ries, authors such as Ardichvili et al. (2003) argue that in start-ups, learning through experience is fundamental given their uncertain context. The entrepreneurs’ ability to judge and evaluate every business situation is improved through learning-by-doing (Colombo and Grilli, 2005) and experience expedites the process of understanding the task at hand since it reduces the unknown when foreseeing the outcomes of such task (Dimov, 2010). The experience of entrepreneurial activity leads the entrepreneurs to develop cognitive frameworks which strengthen their ability to evaluate and select opportunities and thereafter, formulate more sophisticated judgments (Baron and Ensley, 2006).

The consequence of the importance of experience in the start-up world results in many studies recognizing that prior industry-related experience, prior start-up experience and prior experience in growing other businesses have a direct impact on the growth and rate of survival of such new firms (See for example Stuart et al., 1990, Baum et al., 2001 and Ucbasaran et al. 2003).

Eisenhardt and Schoonhoven (1990) also investigated the implications of the knowledge composition of founding teams to the survival of the new venture. These authors argue that the heterogeneity of the backgrounds within the group and the number of members are critical for the growth of the firm. Moreover, the cohesiveness between them also influences growth since it has a direct impact in the quality and frequency of communication between the individuals.

What is understood as managerial capability in this thesis is then the ability of a firm to repeatedly perform tasks that combine the three knowledge domains mentioned by McKelvey and Heidemann Lassen (2013). If management is commonly assumed to be the administration of resources, managerial capability could be seen as mastering the administration of knowledge resources that belong to different domains and which need to come together to drive a successful business.
3.4.2 Novice Entrepreneurs

The focus of this study will be on new ventures founded by novice entrepreneurs. Westhead et al. (2005) contrast the novice entrepreneur with the serial entrepreneur, whose experience is characterized by multiple processes of starting new ventures. On the contrary, the term ‘novice’ refers to entrepreneurs starting their first venture, with no prior business ownership experience either as a founder, inheritor or purchaser of an independent business (Westhead et al., 2005:394).

As stated above, prior entrepreneurial or start-up experience is one of the start-up success factors more broadly recognized in literature as such. The fact that a start-up founder or founders are novice entrepreneurs rules out that factor of success. It implies that they do not have previous experience or knowledge about starting a business on which to base their actions and interpretations of the events affecting the start-up (Landberg, 2008). It also implies that they lack connections with actors relevant in the creation of new ventures such as investors, customers, talent, governmental authorities, suppliers, etc. (ibid). Given that resource constraints are a characteristic of a start-up, these constraints become more severe if the founder is also a novice entrepreneur, making the success of the new enterprise even more uncertain. They face what Baker and Nelson (2005:329) call “the paradox of creating something from nothing”.

A way of conceiving this in the light of the purpose of this thesis is that novice entrepreneurs have larger deficiencies in the business side of the knowledge requirement equation. They may have a product, but the knowledge as to how to translate it into a company is lacking, which can act as an intensifier of the liability of newness (Politis, 2008).

3.4.3 The Role of Incubators

An incubator is defined by Hackett and Dilts (2004:57) as “a shared office space facility that seeks to provide its incubates with a strategic, value-adding intervention system (i.e. business incubation) of monitoring and business assistance”. The incubation itself controls and links resources in order to facilitate the development of the business of the incubates and also to contain the costs of their potential failure (ibid). The authors further argue that an incubator also provides a network of individuals and organizations that the start-ups will require, such as coaches, peer start-ups, accountants, lawyers, consultants, investors, venture capitalists, governmental grants, among others.
Two early studies in business incubation pinpoint the value that business incubation adds to new ventures. Campbell et al. (1985) list that the benefits that new companies obtain from incubation are:

- Diagnosis of business needs
- Selection and monitored application of business services
- Provision of financing
- Provision of access to the incubator network

Smilor and Gill (1986) expand this list by adding the following contribution of business incubation:

- Development of credibility
- Shortening of the entrepreneurial learning curve
- Quicker solution of problems
- Access to an entrepreneurial network

Having the focus on a knowledge perspective and novice entrepreneurs with a lack of business knowledge, the focus of this thesis will be set mainly on the role of the incubator as an accelerator of learning and a source of knowledge resources.

**Summary**

Given that the purpose of this thesis is to construct propositions regarding the process of developing managerial capability in incubated start-ups, the aim of this chapter was to provide the theoretical categories and concepts that will aid in the attainment of that purpose. The first step was addressing the knowledge-based body of literature by first developing a working definition of the concept of knowledge and its taxonomies which will guide the analysis of the observed empirical phenomena. Since knowledge is considered to be fundamental to understand the development of the case companies, this thesis adopted a knowledge-based perspective, which was described as well in the first section of this chapter. The description of the processes of knowledge acquisition and knowledge integration followed. This was due to the fact that these processes are considered to be of vital importance to describe how the studied start-ups develop managerial capability over time. Knowledge acquisition will describe how the case companies access the knowledge they lack while knowledge integration will describe how managerial capability is built.
The second body of literature addressed the context of business start-ups. A complete definition of what a start-up is was rebuilt by adding together three partial definitions collected in the limited literature about the topic. Further on, a model of organizational life cycles was presented in order to understand the characteristics expected from a start-up according to their level of development.

The chapter finished with a section that brings the two bodies of literature closer together by describing the knowledge that start-ups require to grow, as well as how this is even more crucial in the case of novice entrepreneurs. From the combination of knowledge requirements and novice entrepreneurship, the role of the incubator as an engine that exposes the companies to the required knowledge was described.
CHAPTER 4: Empirical research

This chapter will describe the empirical results obtained during the interviews that were performed. In order to get a better understanding of the start-ups and their respective circumstances, the chapter will start by providing a brief introduction of each of the companies and their product offering. Due to the central role in this thesis held by the incubator LEAD, as well as the supporting function from InnovationskontorEtt, their operations will also be presented in more detail. After the initial presentations of the central entities the chapter will follow with the sequential presentation of the temporal events that describe the development of the case companies, starting with the background of the founders. The incubator itself structure its work according to two development stages, namely ‘verification phase’ and ‘growth phase’. Consequently, the description of the development of the start-ups will follow those two stages. The comparison between company cases will be done based on the attributes that are connected to each of the developmental phases. The chapter will end with a summary that highlights and reconstructs the main findings that have been mentioned. If needed, the reader is encouraged to go back to Figure 3 in the method chapter, where all actors are listed in order to recall their role in the case companies.

4.1 Profile of the Studied Incubated Companies

As promised, this section will provide a short description of the three case companies used in this study. Starting with Kulipa- the young model pupil, to SenionLab - a high tech rising star - and last but not least, Graphensic - a company based on complex research with promising future applications.

4.1.1 Kulipa

Kulipa started as a university project where five Computer Science and Electrical Engineering students wanted to create a faster way of paying for coffee and sandwiches in the school cafeterias in order to minimize queuing for customers and thus also pressure for the restaurant. Today they offer a cellphone application for restaurants in Linköping, Norrköping, Stockholm, Göteborg and Malmö where customers can both order and pay for their food in advance. Today, only three of the original founders remain in the company and none of them had previous entrepreneurial experience. Kulipa was admitted into LEAD in April 2012, and will “graduate” in late April 2015.
4.1.2 SenionLab

SenionLab is a start-up venture offering companies indoor positioning software to be run on mobile devices. The service includes wayfinding, geofencing for location based messaging and real time tracking of friends or colleagues, among others, and it can be run on any smartphone. Nowadays, the firm is recognized as the world's most powerful, smooth and robust indoor positioning system provider and has earned a place on the list of Sweden's hottest young technology companies for two consecutive years. The company was founded in 2010 by a group of six researchers in the field of electronic engineering from Linköping University. This was their first entrepreneurial venture both individually and as a group. From the original group, four are still working in the company while the other two just participate in the ownership. The company has now 250 customers located in 32 different countries. Since 2012 and until summer 2015 SenionLab has its office in the start-up incubator LEAD.

4.1.3 Graphensic

Graphensic is a high technology company, founded in 2011 by three professors and researchers from Linköping University. They became the first European supplier of epitaxial graphene on silicon carbide. Graphene is a Nobel-prize winning material which applications are still in an emergent state in the market, but which are believed to become the future of materials for coating in big branches such as electronics and solar cells. Nowadays, they generate income by selling samples to other researchers to elevate their researching possibilities. In late 2014, the company hired an external CEO that took over the everyday business responsibility, while the original research group continued with developing the manufacturing process. Up until today, they have together over 500 publications and two patents. Graphensic joined LEAD in March 2012 and left in March 2015, a few weeks after the first interview was conducted.

4.1.4 InnovationskontorEtt

InnovationskontorEtt has the business incubator LEAD as a sister company, but is differentiated in the way that it focuses more on the business idea than the actual start-up phase. Gio Fornell, an innovation counselor at InnovationskontorEtt describes the operations with the following: “We start here with the idea. Typically when we work with a project, the researchers are still employed by the university, they have a full time job at the university and the students are perhaps still studying full time.” Later, when the individual behind the idea decides to commit more amount of time to pursue it, they will be transferred to the incubator LEAD, which has an inclusion criteria,
such as the requirement to spend at least one day per week in the incubator. InnovationskontorEtt on the other hand helps everyone, no matter the nature of the business idea nor are they requiring any commitment. Thus, they do not see much of the formalities around the founded start-ups but mostly work with initial business idea and how to refine it to create the best possible product or service offering.

4.1.4 The LEAD Incubator

The LEAD incubator was founded in 2007 as a result of an initiative by the Linköping and Norrköping municipality together with the current owner, Linköping University. The operations were based on the American model where it was common to gather many start-ups in the same location and where resources were provided in order to support the development of the start-ups. LEAD was created on the same premises, where competence and a network are the most important resources to be served. The intention behind the incubation was to increase opportunities of commercializing the results of the research that is undertaken at the university. Thus, LEAD aims at refining the ideas that should be the basis for the new company, and later on support them during the first time of being an up-and-running company. Once a company is admitted to LEAD, they remain there for three years. During this period, the company gets their own office in the incubator’s facilities as well as regular coaching with one of the business coaches. “The role we have is to, in a structured way, to help the entrepreneurs to develop their companies” as explained by one of the coaches at LEAD, Lars Bengtsson. The LEAD incubator does not limit their support to companies based on research ideas, but are open to all companies developed in the surrounding of Linköping and Norrköping. Nevertheless, a certain level of innovativeness is required in order to be admitted, either uniqueness concerning the technology or a completely new business idea.

The three year incubation process is divided into two different steps; verification and growth. The initial phase, verification, aims at refining the idea and set focus on the customers and which customer need the company actually will focus on. The purpose of the initial phase is to come to a position in which a complete business model is in place, which the company can use to build its operation around it. LEAD is using the tool Business Model Canvas which aims at first identifying and isolating the actual problem perceived by the customers. After that, focus will be placed on how to create customer relations, sales and marketing channel, key activities in the operation as well as looking into the financial issues. As explained by Lars Bengtsson, researchers and engineers tend to be in love with their idea, where the result of their research project often
has led to a great solution, but they are not certain which problem they will solve with it. Thus
the focus needs to be shifted from the solution they have created and instead approach the
problem. Bengtsson continues; “We discourage them a bit initially by saying ‘we don’t care about
the idea. We care about the solution’. [...] so we are a bit difficult for many entrepreneurs in the
very first phase, forcing them to become more customer oriented”. Ideally, the verification phase
should not last more than three months, but following Bengtsson’s words; “honestly, we rarely
succeed to keep it that short”. In some extreme cases, as is the case with one of the start-ups in
this research, the company never manages to leave the verification phase before they graduate
from the incubator. This often is the case with companies in life sciences, which usually take a
lot of time since they require a certification of the project before they can actually start building
the company around it. Even though the time spent for verification varies between the start-ups,
the goal with the first phase is to build a complete scalable business model, i.e. where you repeat
what you have done successfully with the first customer, to the least possible cost as was explained
by Bengtsson.

Once the business model is in place, the start-up moves to the growth phase. Here, the actual
company building will be in focus. This includes management issues, hiring new individuals,
creating a board of directors, i.e. striving towards a more formalized organization. Creating a
structure in the companies is thus in focus in the growth phase, and it is also in this phase that
the role of the CEO starts to become more formal. Consequently, the business coaches spend less
time with all the other employees in the organization, and instead the CEO will be the only one
who obtains coaching. This is in order not undermine the role of the CEO, and instead the CEO
will create action plans for everyone involved in the start-up. Oftentimes, the coaching meetings
deals with the questions “What have you done since last time and how did it go?” in order to
establish what needs to be done next.

This routine of regular coaching meetings, is complemented by seminars, sales and pitch training
as well as helping the start-ups to get in contact with investors and grant givers during the three
years of incubation. As a natural development, the further down the road the start-ups are moving,
the more independent they get. When graduating from LEAD, the organization becomes an
alumni organization. According to Bengtsson, the companies that graduate are very different but
one can see similarities in their structure and set up as well as a customer orientation. Even though
the start-up’s development may differ depending on the nature of the company, when leaving the
incubator, the start-up may not necessarily have taken off growth-wise. Rather, when leaving it
means that they do not have much more to learn. Outside the incubator the start-ups have to continue their operations without any help from business coaches or peer organizations but with a stronger bundle of competences to cope with market conditions.

![Figure 11: Framework of start-up development used by LEAD incubator](image)

### 4.2 Verification

When gathering data for this empirical research, the importance LEAD has had on the progress of the case companies was realized early on. Therefore, in order to provide a structure when presenting the following empirical data, the two steps of development used by LEAD, i.e. ‘verification’ and ‘growth’, will serve as the framework when illustrating the progress undertaken by the start-ups.

In this section the first phase and the initial evolution of the case companies will be explored. This implies that the presented information includes the background of the founders as well events from the moment they were officially founded to the point when the business idea has been refined. This first phase will focus on the early coaching and the essential change of mindset necessary in order to fully embrace a customer perspective as well as the CEOs role in this transition.

#### 4.2.1 Background of the Founders

When looking at the background of the founding groups we find the first substantial difference between the studied start-ups. The three cases differ not only in the field of specialization but most of all in the years of experience and the depth of the specialization. There is a general agreement among the interviewees on that this factor had a great impact the development of the companies.
Kulipa may be placed in the extreme of the spectrum with the least experience. This company was founded by five students in their early 20s studying the Master’s program in Computer Science and Electrical Engineering at Linköping University. Two of them stepped aside from the project before it started to become a business idea.

SenionLab is easily located in the middle of this scale. This company was founded by young PhD students or researchers in their late 20s or early 30s from Linköping University. The original group consisted of four people researching within the fields of Automatic Control and Computer and Information Science, specialized in topics such as sensor fusion for automotive safety applications, planning and surveillance applications and statistical estimation and detection methods, among others. The original group was later on expanded with the introduction of an additional PhD student in Automatic Control and a professor from the Electrical Engineer Department.

Finally, Graphensic may be found in the most experienced and specialized extreme of these three cases. The company has been founded by three Linköping University’s prestigious researchers in the field of Material Sciences with several decades of experience. By the time of the foundation, their ages spanned from 44 to 71 years old. One of them is recognized internationally as the leading researcher in graphene, and the work of the three researchers together surpasses 500 publications on related topics. The result is that in the laboratories of Linköping University the highest quality graphene in the world is manufactured.

Some of the interviewees recognize that the background of the entrepreneurs and the depth of their specialization and experience usually have a great impact on how the company develops. In general terms, the longer the time spent researching the more technologically sophisticated the products are, but the harder is to start thinking of the product or service as a business.

4.2.2 Foundation and the Admission to LEAD

Kulipa’s solution to explosive queues was considered to have potential and fulfilled the scalability requirements posed by LEAD. Kulipa was thus admitted into the incubator in May 2012, around seven months after the initial contact with InnovationskontorEtt. The company was officially registered around the same time. According to the founder Erik Södermark, what LEAD provided them in the beginning was “the next logical steps” and continues by saying that “when starting a company [...] there is no, like resource, that you can turn to see, like what is expected from me”. InnovationskontorEtt helped Kulipa with building something that was more than just a side
project by providing tools and recommendations, however what LEAD could provide was structure.

SenionLab was created in August 2010 (officially registered in November 2010) as a reaction to attracting their first customer. Initially, they tried to run the company independently from an incubator, and only working part-time with the start-ups aside from their full-time jobs as PhD students. They worked with SenionLab on evenings and weekends for three years until they all started to let go of the employment at the university in order to fully pursue their business idea. Jonas Callmer, the CPO of SenionLab explained the ambiguity in terms of performance of those early days; “it’s dangerous because you might get seduced into thinking that this is going to be awesome. You have a paying customer and it is just going to add on. Well, it doesn’t”. Christian Lundquist, the CEO of SenionLab said that they had reached a point where the survival of their start-up was completely dependent on full commitment and support, thus in June 2012 they entered LEAD.

The business behind Graphensic was fostered through meetings with InnovationskontorEtt. The combination of a top-notch technological idea with an entrepreneurial interest called the attention of one of the business developers at InnovationskontorEtt, Gio Fornell. Graphene seemed to be facing a promising future and in Linköping University there was a group of brilliant researchers developing the best graphene in the world and giving it away for free. There was a latent business behind it so Fornell was allowed to devote more time on the graphene case to keep cultivating the entrepreneurial interest of the group. He started by meeting the three researchers working with graphene on a weekly basis and, among other things, asked them to count the amount of samples they were giving away. From his business perspective, this would have represented a solid customer base if they would ask money in return for the samples and a good starting point for a business. The process of getting all three of them on board of the idea, of aligning their vision for the project, of crafting a solid business plan and of pushing the group through the required stages of the foundation of a company took around a year. A few months after the company was officially formed, in late 2011, they were accepted into LEAD. The start of the incubation period did not translate into the researchers devoting more time to the company. All three founders continued working full-time at the university dedicating only their extra time to the company. They hired the business consultant Jonas Nilsson, who mentored Syväjärvi in one of the entrepreneurship programs he attended to, to be in charge of business-related issues. Nilsson has a broad experience in research-based high-tech start-ups. Among other jobs, he has
been CEO in a LEAD alumni, SP Devices and was currently business coach at InnovationskontorEtt.

4.2.3 Early Coaching

The personal coaching is one of the main pillars of the LEAD incubation program. Bengtsson clarifies the coaching approach in the early phase by stating that “We call ourselves coaches, but in all honesty, we are not really coaches. In the early phases, we are more project managers I would say, and we lead the entrepreneur by the hand pretty much and tell them what to do”. The coaching is initially scheduled once a week with one of the business coaches. But as explained by Erik Södermark, the CEO of Kulipa; “…the coaches are always available, I can like call them 24/7 and ask questions and if I need them to be with me somewhere, like in a meeting or something like that, they are always up for it.” In the beginning, the business coaches meet all individuals in the start-up even though the CEO has the main responsibility. This is based on the LEAD approach as explained by Lars Bengtsson that “all successful companies need to be customer oriented I believe. So the more customer oriented they are the better it is [...] no matter what role you have”.

For Kulipa, the verification phase mostly dealt with the question ‘what is it that we want to do?’ which was also identified as the biggest problem by the CEO Södermark; “Not only what we want to do, but what that the market wants, what the problems are.” After talking to several customers, such as the restaurants at the university and the ones in the surroundings of the LEAD offices, Kulipa felt reasonably confident in being able to create a feasible and scalable business model. With the guidance of the coaches they realized the potential scalability that could be achieved through fragmenting the offer to serve different customer needs and through open sourcing their platform. Those decisions were recognized to have put them in the growth stage. Thus, they moved on to the growth phase in the summer of 2014 and could start developing their business.

The verification phase of SenionLab looked somewhat different. Partly because the founders tried to “go on their own” before utilizing the incubator. As was explained earlier in this chapter by Bengtsson, research tend to create a solution to a problem which has not yet been identified. This was the case of SenionLab, who created their first product offering without being sure of what the customer really asked for. When they later on were admitted to LEAD, the business coach then tried to help them to improve their business idea. Christian Lundquist, CEO of SenionLab,
commented that the coaching in the early phases, not only from LEAD but also from InnovationskontorEtt and entrepreneurship courses, was difficult to grasp and thus was of little use for them since the content was too advanced. He claimed that talking about issues such as business models, customer needs and markets segments did not have much significance when they were not familiar with basic business concepts. According to Bengtsson however, the company became better at listening properly to the reactions of their first customers and gradually have gained better understanding of where they should address their forces in the market. After closing a few initial deals, SenionLab could proactively scale and build their business and moved on to the growth phase around the same time as Kulipa, in the summer of 2014. The early coaching for SenionLab therefore gravitated more around identifying potential market segments and in this process, realized that indoor positioning system is not one homogenous segment but rather several that in turn has different needs and benefits.

The coaching in the verification phase of Graphensic has surrounded the struggle of determining what market segment the company's business model will be aiming to. Due to the complexity of materials, graphene will mostly likely become a lucrative material in the future, but as for now, the focus is set on trying to identify potential markets segments that should be targeted. The founder Syväjärvi explained this by stating that “material sales is not what the company will be big in. […] the researchers, they are a limitation because they would not buy more. It will not be a big business”. One of the market segments that has been found is that of biosensors. They therefore started to sell samples to researchers in the biosensors field to get an understanding as to how that market can possibly look. However, this initiative still involves the limited sales to researchers and is based on a guess about how the market is going to work and how the business model is going to be applied in a time perspective.

Before the external CEO was hired, Mikael Syväjärvi and the business consultant Jonas Nilsson were the ones that most often attended the coaching meetings. Syväjärvi found that LEAD helped in the way that they could pinpoint some things from a market point of view, which the founders, being researchers, may not understand. However, he further explained that Graphensic is a challenging case, since the technology is so new, “in graphene research there are no roadmaps, ‘this is how you should do it’. So there are no answers. And then if there are no answers we have difficulties to envision where we will be. So we have to be very adaptive to the situation of the graphene case.”
4.2.4 Change of Mindset: From the Product to the Customer

One opinion brought forth by a majority of the interviewees, as well as supported by the business coaches at LEAD and InnovationskontorEtt, is that in order to be able to run a company the entrepreneur needs to go through a change of mindset from scientific specialist to an entrepreneur. When asked which skills that are essential in order to manage a start-up, Gio Fornell at InnovationskontorEtt answered; “I wouldn’t say a specific skill, but rather a mindset. [...] You need to see yourself as an entrepreneur in order to be perceived as an entrepreneur”. Sales has been recognized by several interviewees as the most crucial activity in a start-up and the one bringing the individual closer to the customer. As mentioned before, this proximity to the customers is considered to be the main driver behind the company getting a market perspective. Fornell further emphasized that it may be a difference depending on the characteristics of the individuals, i.e. between students and researchers as is the case of this thesis. The entrepreneurs have to go outside their comfort zone and meet the customer very early, in order to see their problem from the customers’ eyes. This is according to Fornell, not an instinct for researchers while students may be more open to go out and make contact with new individuals. Kulipa’s CEO explains this by saying that “the most important thing is talking to customers. And you know, trying to live their problems and to see like ok this, this is actually an actual problem. Because a lot of start-ups I see today, they try to solve problems that are not actually problems”. Exposing themselves to the sales experience is recognized to be a way of breaking with the researcher or engineering mindset and start seeing the company as a business serving a need and not as the technology behind it. That is why, interviewees identify this activity as the platform to move from a situation in which the product is the center to one in which the product and the customer come together in a business transaction.

Fornell continues this discussion by stating that; “I think both the researchers and the students they are smart people and they can learn skills. But changing mindset is another issue”. Lars Bengtsson, the business coach for all the three case companies, is of the same opinion when he explains that you can easily see a difference between researchers and students who becomes entrepreneurs; “how they work, their ideas, their attitudes are certainly different depending on where they come from”. Jonas Nilsson, innovation counselor from InnovationskontorEtt, says that the driver for a researchers is different from that of an entrepreneur, since their focus is in the technology and the solution instead of in building a company. The researcher and the entrepreneur thus need each other, but different things make them tick. Forcing a researcher to become an
entrepreneur, will ultimately lead to that “you get sort of an entrepreneur that doesn’t want to be an entrepreneur and you will lose one good researcher.” Both Fornell and Nilsson state that in case there is not enough mental commitment to the start-up, there is a great risk of failing. Instead, they should do what they are good at. Fornell encourage the potential entrepreneur to think. “If I am a physicist, I am sort of working with equations and are a shy person, should I really do it on my own?”

According to Lars Bengtsson, Kulipa relatively easy embraced the customer focus. Nevertheless, Södermark perceived himself to be very much a novice when it came to business and starting a company. He had participated in a few minor projects before, but in those cases he held the role of developer without any business responsibility. For Södermark, “changing his mindset” mainly entailed stepping out of his comfort zone and making contact with customers in order to obtain that customer focus; “Before, it was a bit scary calling someone or stuff like this. Even if I like talking to people, without having any sort of connection to them, it could be hard”. They all have specialized knowledge within programming and thus could easily develop the product side, while the market side was the one they had to struggle with. He continues stating that students within economics or business administration probably would have the product as their major problem; “it’s like two sides of a coin”, he concludes. Now however, he perceives that the customer focus is a natural part of the organization; “Everyone needs to know what the customer think before they do anything. So at least in our case we always tend to focus on the customer instead of what we would like to focus on. So for us it comes pretty natural.” Nonetheless, for Kulipa, the breakthrough in terms of changing the mindset, came when they managed to get in contact with larger restaurant organizations, which helped them to understand what the customer really wanted in terms of a mobile ordering platform.

Going from the relatively easy change of Kulipa, to the middle of the spectrum, SenionLab is found. The founders were all PhD students at the time of foundation. The CPO, Jonas Callmer, reveals that “being PhD is probably not a very useful thing if you’re an entrepreneur. It’s more a problem than actually a benefit”. According to him, “as an engineer when you start working [with your start-up] you need a good slap in the face a few times to forget about a lot of things you think you know and then understand a few things that you don’t understand. LEAD has in some ways provided slaps in the face to us”. Callmer sees risks in having worked in a university environment for a long period of time, since it will be increasingly harder to accept all the new things you have to learn and that engineers tend to believe that “they know everything”. Similarly,
the Christian Lundquist commented that for him the change of role from PhD to CEO was not easy. What he found to be the hardest step was to accept that even after many years of studying and of specialization within his field, he suddenly found himself being a beginner again in a completely new field. His openness to learn something new helped him succeed in his role. Lars Bengtsson, chairman of the board at SenionLab said that “Christian has certainly changed dramatically over the time that he has been with LEAD. He's like... he's amazing actually. He is so interested, he is so serious and he really tries to develop himself along with the company”.

Jonas Callmer recognized that this change in Lundquist was a consequence of his interaction with customers during the sales process and that it was him who tried to push through the group the emphasis and focus on customer needs and away from the product itself. Callmer further states that being able to change one’s mindset to a customer perspective does not necessarily require an incubator such as LEAD, but it has to be through actual customer interaction, “that’s when you learn”. Today, both Lundquist and Callmer consider themselves to be able to think both ways and the benefits of this ambidexterity is seen in their ease in interpreting what the market wants and translating it into suitable product development.

Moving on to the other end of the spectrum it is Graphensic, where the mindset change proved to meet tougher barriers. Fornell stated that “they had a very academic approach and they were good scientists and they were very social people all of them but they were thinking in terms of research collaboration”. Thus, the first undertaking for Fornell as their innovation counselor was to make the founders understand that their research partners were not partners but customers, to which they could sell samples of their graphene. This was an important step of attempting to change the mindset of the founders. However, there was a problem in the fact that the founders felt a disinterest towards the everyday business activities. Even though the commercialization itself was intriguing for the founders, the other business activities, such as production planning, budget analyses and hiring were performed by a consultant, Jonas Nilsson from InnovationskontorEtt. One of the founders, Mikael Syväjärvi, explained this by saying “actually, our business guy, the consultant I mentioned before, we paid him to do these things. Because we don’t want to do it.”

The problem, according to the business coach Bengtsson, lies in the fact that the founders “they see Graphensic more as an extension of their research”, and Gio Fornell from InnovationskontorEtt states that “the researchers, they were and are quite happy being researchers”. Nilsson supported the explanation by arguing that researchers have a hard time accepting that in business one should “sell first, then develop” since they want to be sure that they deliver perfect products. They might
also feel that they “do not get appreciation for the efforts of making the product, 0.1% better.” Syväjärvi himself clearly stated that “we have decided that our role is to start up, but we will maintain our position in the research”.

Even though business and research may be an equation that does not perfectly add up, Syväjärvi was the founder that was mostly entrepreneurially oriented, while Rositsa Yakimova and Tihomir Iakimov (the other two founders) remained more focused on the research and production of graphene. When Syväjärvi was asked about how he perceived moving from the research area and was exposed to a business environment he answered that “for me it was fun, because I wanted something else, which was commercialization. The good thing is that when you start thinking about business you have to disconnect some of the brain, the engineering brain.” He further commented on that utilizing LEADs facilities and offices is helpful, since you can turn off the research brain; “because here [at university] someone always comes and asks and you need to turn on the research brain again and then you focus on that instead”.

In order to be able to embrace this transition from scientific specialist to becoming an entrepreneur, full involvement is required. From the incubation side, this mindset change is absolutely crucial in order to be able to create a profitable business model. As a key to this, the following section will discuss the importance of the CEO as the catalyst for promoting the business mindset within the start-up.

The Role of the CEO

According to the external CEO Amer Ali and the business consultant Jonas Nilsson, Graphensic had been idle for the first two and half years of its incubation due to that no one was involved full time. “If no one is working at the company, like committing one hundred percent, the company doesn’t really develop”, said Ali. According to Fornell, in groups starting a venture “there is typically some kind of champion. Even if it is a group, there is typically one who starts to perceive himself as ‘this is my company’”. This person is usually selected as the CEO. Bengtsson stated that “the CEO stays the one living and eating the orientation of the company. You need to be able to communicate where you want the company to go”. He continues by explaining that in order to fully absorb this new customer-focus mindset, a lot of effort is placed on the CEO who will serve as a role model for the other employees.

Jonas Nilsson explained that most companies founded by researchers or by the innovative with an idea tend to eventually turn to an external CEO. This is the result of the realization that their
interest is not in building a company but on the sense of pride they have from the result of their research. They focus not on serving a customer need with whatever product or service they can develop but rather on finding uses to their technology. When asked about cases in which the researcher-founder succeeded in turning into a competent CEO, Nilsson answered that “maybe, the entrepreneurs happen to be also researchers” and then continued arguing that “I am not saying that researchers cannot run a company. What I’m saying is that if your personal driver and what makes you happy lies in the technology instead of the business then you’re probably more suited working with the technology than working with building the business”.

In the case of Kulipa, Erik Södermark proved that even with his computer engineering background he was able to take responsibility as the head of the company and to steer it towards working by what the customers want. He believes that his background in other minor projects at the university and his more social nature made the founding group turn to him as CEO. He explains that he had an inclination and interest towards entrepreneurship before founding Kulipa which made the change of field less complex. As was mentioned earlier, he recalls that it was tough to become a persuasive salesperson that had no inhibitions when calling prospective customers. He believed that he eventually could succeed in that activity by doing it repeatedly and building confidence in himself. Even when coaching and courses from LEAD gave him some tools, he believes that becoming good at sales requires personal experience. As a CEO in Kulipa, Södermark’s main goal is keeping it all together. His aim was explained as ensuring that the business, technical development, financials and the team are all lined up towards the same goal.

Similar to Södermark, Christian Lundquist also claims to have been selected as CEO for his more sociable personality, which facilitated the sales and networking processes that the early project required. When asked about how the role of the CEO is different from his role as Product Manager, Jonas Callmer replied “Christian is responsible for everything. Responsible for the economic part, he’s responsible for the relationship with the board and he handles a lot of big customers. Other customers than I do. He does a lot of the agreement negotiations. And you know... he decides... he makes decisions. He has also the personnel part, the HR part […] I do internal work in... I mean I do sales and do deliveries and stuff like that, but my job is more to decide ok, what is it that we do in this company? What is our product? What do we sell? How do we sell it? How should we develop it?”. 
These cases confirm in a way what Jonas Nilsson claimed. The cases of Södermark and Lundquist describe two people with a strong interest in building a company and who were able to put aside their technology-based background. The case of Graphensic also shows that when this interest is not present the company is more likely to hire an external CEO.

Until November 2014, Rositsa Yakimova was the CEO of Graphensic but as Syväjärvi explained selecting her was done “because we needed formally someone in the paper. But we did decide everything all together”. The arrival of Amer Ali as CEO changed the way the company is managed. He is the only full-time employee and he is in charge of every activity except for production, the only daily activity in which the founders remain involved. Syväjärvi describes Ali’s contribution by saying that “when we explain some things he’s looking into that with a business point of view. So how can we earn money on this? This research? He’s thinking like that”. Amer Ali studied Design and Product Management and did a master in Industrial Management at Linköping University and also a specialization in Project, Innovation and Entrepreneurship (PIE). He wrote his Master’s thesis based on Graphensic and studied the market for graphene-based biosensors. After graduating he obtained the job as CEO, which is his first job. Due to his lack of experience he is mentored by Jonas Nilsson. Syväjärvi expressed that “he’s not so mature but at the same time […] Jonas Nilsson came into… he’s experienced. So they make a nice combo”. Nilsson claimed that they have a great personal chemistry with each other which facilitates the openness and trust required for a successful mentorship. Ali commented that for the day of the week when Nilsson works in the company he prepares a list of topics that he wants a second opinion on. When asked to describe his tasks and work Ali replied that he is in charge of financial controlling and that “I am trying to divide my tasks, somewhat. So at least one day a week I focus on sales, and when I say sales it is not receiving orders, that I am doing all the time basically. So we have customers contacting us, and I call them and talk to them, e-mails back and forth. And I get production going by planning it and sending the plan to Rositsa and Tihomir […]}. But one day a week I try to focus on sales, I go through our database, and LEAD’s. I go through Linkedin. I go through Google searches. But also workshops, conferences, etc.”

The precedent two sections described the first period of incubation of the three case companies. It highlighted what the coaching in the verification phase includes, namely to refine the business idea. This was attained by letting go of the focus on the solution the entrepreneurs may have come up with, and instead looking at the nature of the problem the customer are experiencing.

For technologically specialized individuals such as researchers or engineering students this require
a shift in one's mindset. This turned out to be problematic, and the difficulty of changing increased the more specialized one were, and the longer the individual had remained in the university. The last section discussed the important role of the CEO’s in the transition of gaining a more customer-focused mindset and highlighted that in cases where an interest in company building is lacking, an external CEO may be hired.

4.3 Growth

This section will describe the cases once the verification phase has finished and the process of building a structured company begins. At this point, the companies have a clear idea of their business model, what is the value they provide to their customers and they have operations that have the potential to become scalable. The section starts by first, describing some special considerations that need to be made in the case of Graphensic. It will then continue by describing how some characteristics of the growth phase developed in each of the cases.

4.3.1 Special Considerations for Graphensic

The previous section hints that the case of Graphensic presents special characteristics that call for special attention. The company presents some attributes that are distinctive of the growth phase and which will be therefore discussed in this section. However, even when they have already undergone the three years of incubation process, the company is considered to still be in the verification phase. This section will further explain this situation.

Jonas Nilsson, co-owner, chairman of the board and part-time worker at Graphensic, claimed that “Graphensic is maybe an unusual research start-up”. Unlike many start-ups, this company had customers, a revenue and a turnover since day one due to that they turned their research collaborations into a customer base, which translated into early sales volume. This was done with the support of governmental grants, which gave them financial stability. Moreover, as Syväjärvi pointed out, they “rent the equipment from the university […] So we have only income. If we have no sales we have no costs”. Therefore, it is a business in which the financial aspect is less fragile.

The risk factor for this company comes from the fact that graphene is a material which applications are still not in the market. “Graphene is really hot but it is not currently commercially used until maybe 5 years down the road or so” said LEAD coach, Lars Bengtsson. Selling samples to researchers is a very limited business and not a scalable one, but right now it assures the survival
of the company until the applications of graphene are further developed. Bengtsson argued that the characteristics of graphene as a marketable product make the verification phase longer and very different from other products such as the ones offered by SenionLab and Kulipa. This statement is also held by the current CEO, Amer Ali, and the founder Mikael Syväjärvi.

This longer verification phase has also been reinforced by the above-mentioned fact that the full-involvement to the enterprise that is required to develop it has not been present in the case of Graphensic. As pinpointed by the coaches and the founders themselves, Graphensic was conceived as an extension of the founders’ research work and rarely as an independent entity that required a distinctive approach and perspective. In consequence, during most of the incubation period nobody worked full-time in the company and it has not had great progress.

Besides the founders, Jonas Nilsson has also been working in the company almost from the beginning. Since early days of Graphensic he was in charge of business-related issues first as a consultant and later on as part-time employee and co-owner. His business wit is best illustrated by one of the biggest business deals he obtained. Yakimova needed a bigger oven for graphene production for one of her research projects, but the supplier that the university had hired could not deliver on time due to problems with their software programmers. When the university was about to fine the supplier and cancel the order, Nilsson suggested that Graphensic could pay for another programmer to solve the problem if they could have exclusivity in the use of 50% the new oven. The university agreed since it was to be used for just one project. Nilsson rented out the extra capacity to another university for a large sum of money, which provided the funds that allowed Graphensic to survive. Even when he made a great contribution in business terms, the lack of full involvement in the company remained since he only worked in Graphensic once a week. Lars Bengtsson comments on this by saying that “Jonas Nilsson came in and tried to do this one day a week. He has done a really good job, but that’s not the way you run companies”.

Both Nilsson and Bengtsson tried to convince the founders to devote more time to the company, but their prioritization of their research work remained. Ali claimed that after failing to convince the founders, the business coaches “instead of putting their efforts into activating the company, they put their efforts into ensuring that the company would survive”.

This scenario shows very clearly that the company was not still on the path towards the growth stage. However, in November 2014 when they hired a full-time CEO, Amer Ali, the company’s prospects changed. Bengtsson expressed that “by getting Amer on board we are giving the
company a chance. That should have happened several years ago, but we cannot change history”. Coming from an industrial management background, his focus is on building a company and together with Nilsson they imprint a market orientation to Graphensic. Nevertheless, even when the company is now closer to the path of growth, there is still a lot of work ahead in order to get there.

4.3.2 Late Coaching
As Bengtsson explains, the mission of LEAD further down the road is to create organizational structure in the companies and empowering the company’s leadership, but mostly the role of the CEO. This implies that the style of business coaching changes as the companies move to the growth phase. The coach stops meeting with the rest of the team and he puts “much more focus on the CEO […] further down we come, the more independent we want the companies to be. So then it doesn’t really make sense for us to work with all the people, because then we undermine the CEO”, said Bengtsson. The LEAD coach further explains that everyone is welcome to the courses and modules that the incubator offers. It is just the business coaching that becomes exclusive to the leaders of the companies. Even when the CEO is designated as such in the beginning of the project, it is further on through the late coaching when the role becomes more formalized and preeminent.

As commented before, Bengtsson is Södermark’s coach. Kulipa’s CEO describes the coaching by saying that he brings up to the coach issues that he identifies within the company and which he feels the need of discussing about. He argues that the coach helps him to focus in the long-term and to identify how smaller shorter-term issues and actions would fit in that long-term goal. Bengtsson describes the coaching with Södermark by saying that when he sees that the company is losing the direction he asks Södermark “to come up with a plan to solve this. And if his solution is that he personally should do everything regarding customer orientation I am going to certainly question that. So I expect him to come up with a plan in which he involves Rickard and Erik Sjölander [the other founders] and other people as well in this. I don’t want to discuss a plan with Erik Södermark that only focuses on what Erik Södermark himself should do. It’s a plan about what the company needs to do that we discuss”. What is shown with this statement is that even when the CEO is the one obtaining the coaching, he is expected to use that coaching to leverage all the activities within the company and not just his personal tasks.
In the case of SenionLab, Christian Lundquist explained that the coaching he received evolved together with the needs of the company. In the beginning, his coach helped him with hands-on practical issues such as communication, negotiation and pricing. In the later stages of development, the coaching turned to issues in the field of human resources and hiring as well as long-term thinking. Since this company is bigger and functionally more developed, it is not only the CEO who receives coaching. Jonas Callmer, a founder who is the CPO as well as a salesperson, also works with a business coach, which is however different from the one coaching the CEO. Callmer also commented that the coaching they receive now aims not at receiving specific instructions about what to do, but instead they discuss ideas and issues that they may have in order to receive some feedback from the coach and through that feedback re-think their actions and approaches to a problem. Moreover, the coaching helps them to cope with the confusing chaos and stress that a rising start-up implies by providing a space where they can release frustrations and as a source for motivation. The coaches are usually competent in a specific field that matches the work of the coachee. Lundquist’s coach is Gunilla Åberg, specialist in business management, leadership and organizational development. In the case of Callmer, his coach is Stefan Asplund who is a specialist in Product Management. Thus the coaches often convey some field-specific knowledge as well to their coachees.

In the case of Graphensic, it was mainly Mikael Syväjärvi and sometimes Rositsa Yakimova the ones receiving the coaching during the incubation period. Similar to Callmer, Syväjärvi describes the coaching with the Swedish word “bollplank”, which implies that someone bounce back a proposed idea with some feedback. He also emphasized the challenges in bringing at research-based start-up into the incubator; “they will give coaching and they have experience in business. But they don’t know the answers. And this is also a bit challenging with the LEAD or with the coach. Because our sales are so close to research and they have experience from business. So some things they don’t understand which are research-based.” Lars Bengtsson has been the coach for Graphensic. Since his entry as CEO, Ali and Bengtsson worked together in the coaching. “Amer and I met every week, had discussions about how to move ahead, what he could do, how he could position himself in relation to Mikael and Rositsa and that sort of things”, described Bengtsson. Ali presented a similar perspective and described the content of the coaching as board-related and owners-related issues as well as the strategic part of the business rather than its operations.
All three CEOs as well as Syväjärvi recognized that they complement the coaching, modules and courses at LEAD with their own initiative to study about management practices and start-up businesses. Lundquist stated that he has read about start-up businesses, especially the book The Lean Start-up by Eric Ries. He claimed that he used in practice mostly negotiation techniques for setting prices that he read about in books about the topic. Södermark said that “I have read a lot of online resources, not books but like you know blogs and forums”, though he argued that internet is probably not the most reliable source since he believes that there are too many self-proclaimed start-up gurus that have no real knowledge in the topic. Syväjärvi also indicated that he used internet as a source of knowledge that he applied in the company, while when asked about how he complements his education and LEAD experience Ali replied that he does so by reading “books and meeting people with experience”.

4.3.3 New Business Talent

Gio Fornell, coach at InnovationskontorEtt, recognized that one of the attributes of a developing start-up is the fact that growth pushes the company to start looking for competences they lack in the founding group and thus incorporate talent from the outside of the original group. Even when in incubated companies the individuals go through coaching to build knowledge that they lack, sometimes that is not done fast enough or the work of just one or two individuals is not enough for the business demands. In the companies that form this study, the founding group’s strength in terms of talent lies in a technologically elaborate product developed by them. Thus, the talent gap may be found in the other side of the coin, the business side. Therefore, a pattern that is identified in the studied cases is the incorporation of what most of the interviewees call “a business guy” and the formation of a board of directors.

New Employees

In the case of Kulipa, a Business Administration graduate joined the company in March 2015, almost by the end of the incubation period. The role of this new member is to work full-time with sales, focusing mainly in the restaurants located in the university campus. He and Södermark represent now Kulipa’s sales force.

SenionLab is a big company to be just finishing the incubation period. The five founders that work actively in the company now are assisted by six additional employees that were hired since 2014, three of which are working with the business side of operations. “First two more guys were hired in development […] September last year we hired a guy called Jonathan and he started
doing our customer development operations. He basically started off by doing some sales and
deliveries. Then we hired a guy called Wilhem in the spring, in February. He’s also doing that.
And now we hired a girl called Anna who’s helping with the delivery part […] and then we hired
a Head of Development last Tuesday. He’s older. And we will be hiring a Head of Sales and
Marketing soon”, describes Callmer. As Bengtsson comments, this is an exceptionally high
number of hires hardly seen before in LEAD companies. The business is growing fast and
SenionLab is trying to leverage it with the required talent and competences.

The talent incorporations in the case of Graphensic are found in the entry of both Jonas Nilsson
and Amer Ali, whose work has already been described before. When asked what he brought to
the company, Ali summarized their contributions by saying “I brought some of the business
perspective. But quite a lot was already in the firm with Jonas”.

Board of Directors

When start-ups start growing and gaining complexity, many decide to form a board of directors
that help them cope with bigger broader issues. Gio Fornell emphasized the importance of
building a board of directors and its strategic importance. He argued that it is an easy way of
accessing special competence that drive organizational learning. Moreover, start-ups tend to be
good at technology and they are quite weak on the business perspective, “so when you look for
a board member you don’t need to find a technical specialist from exactly this business segment,
but more like having complementary skills and bigger networks”. He further explained that for
this reason, most start-ups incorporate experienced entrepreneurs in their board who typically help
the company in keeping a customer perspective.

Kulipa put together a board of directors by the end of 2014. It is composed by three members:

- Erik Södermark – Kulipa’s CEO
- Anders Westerholm – Restaurant entrepreneur
- Fredrik Malmström – ALMI investor and chairman of the board.

Södermark explained that they plan to meet four times a year and that in those meetings the goal
is to make larger decisions related to the long-term strategies and larger financial aspects, such as
the yearly budget.

SenionLab’s board is composed by:

- Christian Lundquist – SenionLab’s CEO and founder
• Ulf Lewander – SEB Investor
• David Törnqvist – CTO and founder
• David Sonnek – Investor and entrepreneur
• Lars Bengtsson – Entrepreneur, LEAD coach and chairman of the board

Similar to Kulipa, Callmer explained that in the board meetings broader strategic issues are discussed, such as the organizational structure, mapping the next big steps for the company and how to reach market leadership positions.

Finally, Graphensic’s board of directors is constituted by the three founders, Nilsson, who is the chairman, and the CEO. Unlike the previous cases, the board at Graphensic has limited competence to provide the CEO with managerial and strategic knowledge, with the exception of Jonas Nilsson. However, Nilsson is involved in the process of decision making and on the design of the board meetings, which does not make him a source of critical external perspectives. Therefore, the level of contribution in the form of advice and feedback is rather limited and not at the level that should be expected from a board of directors. As Ali describes “I present what has been done, and what I think we should do, and usually they say yes” and concludes that when Graphensic grows more it will be in need to get more specialized competence in the board to be able to work as such and to move its contribution away from research and more into strategies and business.

4.3.4 Emergence of an Organizational Structure

Lars Bengtsson recognized that an important aspect of the growth phase is to build structure into the company. He said that “if you want to build a company then of course you need to be able to identify who should do what and what the organization will look like, and make sure the organization works the way you want it to. [...] And you have to do things, you can’t just... things cannot just happen randomly”. In bigger companies, structures are designed by grouping people in functional departments or by products or markets. However, in a start-up with 10 or less members usually the structure is given by functionally dividing the tasks among the group members.

In the case of Kulipa, Södermark is the CEO, while the other three founders are CTO, CPO and Designer. The newly hired employee works together with Södermark in sales.
SenionLab has worked in a well-structured way from the beginning dividing the tasks in CEO, sales and development between the founders. Nowadays, those functions remain but the CEO is also in charge of sales to the biggest customers, while Callmer adopted the position as CPO and also works with sales with smaller customers. The remaining founders that still work in the company continue working with product development. As mentioned in the previous section, the newly incorporated employees work in either development or customer service and sales. Callmer expressed that they “have been quite well structured in that sense that for example I haven't been involved in development, Christian has not been involved in development, Per has not been involved in sales or they might be there supporting the integration 'thingies' but we are quite well separated. Who's doing what. Now it's getting even more formalized”.

As previously stated, before the entry of Ali, there was no formal structure in Graphensic. The tasks were roughly divided as follows: Syväjärvi handled the incoming orders, Nilsson worked part-time with the business issues assisted by the coach Lars Bengtsson and Yakimova and Iakimov were in charge of the graphene production. Nowadays, Ali does everything but production, which is still in charge of Yakimova and Iakimov. Nilsson mentors Ali and solves more formal paperwork and compliance issues in which the CEO has no experience.

4.3.5 Communication and Coordination

The dynamic of work and the communication and interaction between organizational members within a start-up could be considered to be more simple and straightforward than in bigger organizations. When asked about the patterns of interaction and communication within start-ups Gio Fornell posits that “they talk to each other directly […] we are typically talking about very small organizations and […] sometimes they all sit in the same room and they hear the telephone. So I don’t think this is done in a very professional way I think it is more ad hoc for the smaller companies”. Moreover, he recognizes that the members of the founding group usually are friends or know each other very well before even starting the company, which facilitates the attainment of trust, communication and therefore, the coordination of activities and functions.

In Kulipa’s case this smooth communication and interaction that was mentioned above is easy to see. Södermark, as the CEO is responsible for being the final decision-maker but he argues that he does so by also including the inputs of the rest of the organizational members. For some decisions they even use a voting system. The fact that they are few and that most of them share the same background in computer engineering generates that “everyone seems to be on the same
wavelength so decision-making is quite easy [...]. We overlap pretty much in every aspect”. Södermark mentioned that the method he uses for keeping everyone informed and aligned is having weekly meetings so that everyone knows what is happening and what will happen. “So I hold these meetings to bring everyone on board on what’s happening right now and what will happen in the future. [...] We have our weekly meetings every Monday. So those meeting consist on “what happened last week?”, discussion of potential problems or issues that we need to discuss and then we focus on what we will do this week. So usually on Sundays I sit down and plan what everyone is going to do this week and during our discussion we add things on that list”. In these meetings they make smaller short-term decisions such as a system bug that needs to be fixed during that week, and medium-term decisions, sometimes setting goals for three months and six months. As mentioned above for broader, more strategic and long-term actions the board of directors is involved in the decision-making. Also, the other members bring to those meetings ideas and proposals that are discussed. Moreover, walking through the corridors of LEAD, the three founders are usually seen sitting together working in the same room.

In comparison to Kulipa, SenionLab has grown to be a bigger start-up and thus the role of the CEO in the conduction of the activities is stronger in order to achieve coordination and alignment. As Callmer comments, he does not need to bring up to the CEO the smaller decisions within his functional area. However, the ones that involve more resources or have a bigger impact on the business need to be consulted with Lundquist. Still, they have known each other from before the foundation of SenionLab, they come from the same background and the interaction between them in the daily activities is very strong, what led Callmer to state that “you talked to Christian, and Christian and I pretty much agree on everything”. The strong bonds and trust among the leaders of the company is also something that was highlighted as important for integration by Callmer. This trust is not only built based on their personal relationships, but also on the fact that even when they both handle business-related issues they still have the heavy-weight technological knowledge about the product. “Christian has... even though he says that he doesn’t really understand anything... he knows stuff. Much much more than any external CEO will ever know this product. And the same thing for me. I understand basically what’s happening underneath. Even though I don’t know exactly how they implement it”.

When asked about the existence of two distinct bodies of knowledge in the company, i.e. technological knowledge and business knowledge, Callmer argued that his role as CPO is to be the bridge between the two. Again, the fact that he is able to speak the same language and have
the same codes as the developers helps him in this integrative task. “I can think both ways. And it’s much easier for me to speak to customers because I understand the market. It’s hard but I still have the technical knowledge, so if I say something they [the developers] trust me, to a very large degree. If I say this and this is not good, this is good for this and this reason, they trust me! And they wouldn’t do that if I just came from the market side. But I couldn’t come from the tech side and just say like “this is how you do it” and don’t consider the market part”, said Callmer. However, he further mentioned that the fact that the developers do not get contact with the customers and that they do not get business coaching sometimes harms the speed and direction of the product development. He argues that even though they are able to repeat the “customer orientation mantra” they do not fully apprehend and understand it. It is seen for example is the lack of dedication to serve a customer in time in order to develop a product that is marginally better.

As mentioned above, the other sphere of decision making in SenionLab is the board of directors. They oversee the CEOs work and assist him in analyzing current strategies and how these strategies fit in the long term goals. They also follow up that the commitments made in previous meetings are fulfilled. The CEO then takes the inputs from the board to adjust the direction, orientation and actions of the company.

The case of Graphensic again shows several divergent aspects compared to the other two case companies. In the everyday operations it is the CEO who decides and performs himself all the activities except for the production. The link between both spheres is straightforward: the CEO performs his everyday tasks and when he gets an order he informs this to Yakimova, who produces the required amounts, and then the CEO picks up the product and ships it. That is the only interaction that there is term of operations between the two bodies of knowledge. However, Ali also explained that “usually I just don’t fetch the products, I stay and we talk about what’s happening [with Yakimova] what the status is of the production, what the status is of the business. I always check up, does she has some questions on the latest monthly report so try to have some feedback”. The CEO does not have regular contact with the other two founders, Syväjärvi and Iakimov. Jonas Nilsson’s part-time work is mainly mentoring Ali. “Thursdays, I have Jonas for eight hours. And usually I am prepared and have an agenda, and say ‘I’d like to bring up these things’ […] That’s how I use him and usually he says, ‘you decide’”, said Ali.
As commented before, the board of directors is composed by the five people involved in the company: Ali, Nilsson, Yakimova, Syväjärvi and Iakimov. These meetings are the only moment in which everyone meets and where Ali presents all that has been done since the previous meeting. When describing the dynamic of the board discussions Ali explained “Rositsa /Yakimova/ for example, it is not like she doesn’t have anything to say and just sits and listens, she always has something. Which I try to incorporate into the next meeting. But usually, and mostly, they don’t have a lot of things to say about the business. So we have discussed the business on quite abstract levels, but when it comes to taking the visions and putting them into practice, they do not know what works, what’s a good idea, what’s a bad idea, how to do these things. So basically they say ‘you can take care of that’. He also commented that at this point the contribution of the board meetings are not at the level that should be expected from a board of directors because more than half of the members do not have the competence to provide suggestions about how to proceed in practical terms with the strategies and goals set for the company. Therefore, sometimes the board discussions focus on aspects connected to the research. “Usually I prepare the board meetings with Jonas. So unfortunately, all the major decisions go only through two people. Hopefully two competent people”, concludes Ali.

Summary

This chapter described and compared the cases of three incubated start-ups: Kulipa, SenionLab and Graphensic. Moreover, the role and working practices of the LEAD incubator have been explained. To structure the empirical findings, the chapter has been divided in sections that follow the temporal order of events, starting by the period prior to incubation, in which the group is formed around an idea, and then followed by the development stages framework used by the LEAD incubator, namely verification and growth.

The case comparison shows that even when the cases share the incubation time scope, the location and the university background the cases are dissimilar in many aspects. The process of balancing the technological knowledge that originated the product with business knowledge required to build a business is affected by a series of factors that differ from case to case. The most crucial aspect of this process identified by the interviewees was the acquisition of a commercial mindset in which the customer needs are the focus. This transition is highly influenced by the depth of the scientific knowledge and therefore the ease with which the novice entrepreneurs succeed in adopting this new vision. The comparative study shows that the longer the time spent in scientific
activities, the harder it is to turn to a business focused perspective. Moreover, the case of Graphensic shows that the prioritization of research over the management of the start-up also affects the transition due to the scant involvement.

In terms of the actors that aid the firm in the process of company building, the empirical study shows that in early days this support come in the form of close and direct assistance to the whole group and more processed information, from sources such as coaches and courses. In later stages the figure of the CEO becomes more prominent since it is the one receiving the constant coaching and contact with the board of directors. These later stages are also characterized by the fact that the talent and expertise no longer come from the inside of the founding group but external competence is acquired in the form of new recruitment and the formation of a board of directors.

Finally, this chapter also commented how the structure, the role of the CEO, the social bonds and the board of directors interplay to determine how the company is aligned and how the decisions that lead to actions are made.
CHAPTER 5: Analysis

After having described the empirical study as well as the theoretical framework that will be used in this thesis, this chapter will aim at applying the theoretical categories and concepts into the study of the empirical findings. Through the interpretation of the comparative empirical findings in the light of the knowledge-based theory, the analysis chapter intends to bring the discussion closer to the attainment of the purpose.

The starting point of the discussion is that companies need the managerial capability in order to be able to grow a business based on an innovative technological product. This idea will require the examination of knowledge at individual level as well as collective. Moreover, it also calls for the exploration of knowledge sources and the knowledge processes that lead to the formation of managerial capabilities.

The chapter will be structured to start by a theoretical conceptualization of the empirical findings that will serve as a platform to discuss them in the rest of the chapter, based on the theory outlined in Chapter 3. The second and third part of this chapter will follow the temporal order set in the empirical chapter. Therefore, the second part will discuss the emerging process of managerial capability development in the context of the verification phase while the third part will discuss the same process but in the more advanced context of the growth phase.

5.1 Theoretical Conceptualization of the Empirical Findings

This section’s goal is to bring the key concepts and topics found in the empirical study to the language and notions delineated in the theoretical framework. This is necessary to be able to hold the analysis discussion based on the framework provided by the theory through a unified way of referring to the events, phenomena and actions.

5.1.1 Managerial Capability

In order to trace relevant events, actions and issues in the empirical study so as to attain the purpose it is necessary to clarify how the authors mapped managerial capability in the empirical research.

As commented in Chapter 1 and Chapter 3, in this study the concept of managerial capability is understood as the ability of a firm to repeatedly perform tasks that combine the technological-
related knowledge with business-related knowledge. Therefore it is composed by the integration of individual specialized knowledge in the field of technology and business.

![Managerial capability diagram]

**Figure 12: Conceptualization of managerial capability, based on Grant (1996b)**

While the authors perceived the predominance of technological or product-related capability by behaviors that are based on thinking just about ‘the solution’, the higher-order managerial capability was evidenced by comments referred to making the company responsive to the market by thinking about the ‘the problem’ to be solved. This points at the fact that the specialized knowledge that needs to be integrated to form managerial capability belongs to the field of business knowledge as well as technological knowledge. Therefore, in order to identify relevant data in the empirical study, focus was on finding comments, events and actions showing how the companies worked with the process company building which evidenced the effort to deliver a product according to customer’s needs in order to drive sales and market success.

### 5.1.2 Tacit and Explicit Knowledge

Analyzing the empirical findings, it will be a recurring theme to identify different streams of both explicit and tacit knowledge flowing from diverse sources to the case companies. The outline of the differences between these two types of knowledge done in Figure 5 will support the identification and characterization of these streams of knowledge. In order to aid the understanding of the reader, Figure 13 presents a summary of how the authors will characterize
every source of knowledge found in the empirical research. During the process of analysis this characterization will be further explained.

<table>
<thead>
<tr>
<th>Explicit knowledge</th>
<th>Tacit knowledge</th>
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<tbody>
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<td>• Hiring</td>
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<td>• Studying</td>
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<td>• LEAD courses</td>
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_Figure 13: Identification of tacit and explicit knowledge streams_

### 5.1.4 Organizational Life Cycle

For this section, the theory of the organizational life cycle presented by Hanks et al. (1993) will be combined with the framework of verification and growth phases used by the incubator LEAD. In the framework by Hanks et al. (1993), there are two phases that are relevant for this discussion, the start-up stage and the expansion phase, which will consequently be explained in chronological order.

The verification phase as described by LEAD coach, Lars Bengtsson, corresponds to the characteristics of one of the stages proposed by Hanks et al. (1993) in their model of the organizational life cycle. The first stage of their model is referred to as ‘the start-up stage’. However, it is important to firstly note that when they use the concept ‘start-up stage’, they refer to ‘the take-off’ of all new companies when they commence on this new journey and thus should not be mistaken for the concepts of a “start-up business”. Hanks et al. (1993) found that a new venture in that stage is ‘young’ and ‘small’, which is applicable to all of the three cases companies when they belonged to the verification phase. The growth rate of an organization in the ‘start-up stage’ is according to Hanks et al. (1993) very inconsistent, which is something that fits well in all the three cases. Optimistic periods connected to getting that first customer, was alternated with the premise of “no income, no cost” which was followed by Graphensic and SenionLab. Kulipa also experienced inconsistent growth but this was due to that they tried to take shortcuts which lead to that products were developed but not really relevant for the customers. Moreover, companies in the ‘start-up stage’ have a very simple structural form and with a high level of informal organizational procedures with few policies and highly personal communication. This is also apparent is the three cases since in the very beginning they were a group of friends or
colleagues, with informal communication and loose division of functions. According to Hanks et al. (1993), the main business tasks that are dealt with in the start-up stage are (i) to identify a market niche, (ii) to obtain resources, (iii) to build prototype and (iv) to set up a task structure. This corresponds almost perfectly to the aims of the verification phase as proposed by LEAD.

Moving forward in the organizational life cycle as proposed by Hanks et al. (1993) the new venture enters the ‘expansion’ phase. This phase also correlate to what was found in the empirical data concerning the ‘growth phase’ as proposed by LEAD. The growth pattern among start-ups found by Hanks et al. (1993) in the expansion phase is presented as ‘rapid positive’. The fact that both Kulipa and SenionLab are in this stage was due to the fact that their business model translated into growth. The expansion phase is also characterized by emerging formal systems, which can be noticed in the case companies by firstly seeing titles appear, such as the CEO and the CPO. Furthermore, an increasing amount freedom is given to the individuals when it comes to ‘their own area’ of expertise, even though most issues still are discussed together. A higher level of formalization implies a high level of centralization, even though it is still very low compared to larger, already established firms. Both Kulipa and SenionLab have started to recruit new talent and thus, the operations are becoming more formal in terms of delegating tasks, both among the founders and the new employees.

This evidence of correlations between ‘verification phase’ – ‘start-up stage’ and ‘growth phase’ – ‘expansion stage’ show that, as predicted by literature, the case companies went through two distinct developmental stages that present special characteristics and priorities that need to be considered in this analysis. It is worth noting that the stages will be referred to with the names provided by the empirical research so as to aid the understanding of the reader.

5.1.5 Knowledge Processes

As stated in the theoretical chapter, knowledge is dynamic and flows through and organization rather than being a static resource. Consequently, analyzing it in the context of an organization becomes a matter of observing dynamic processes. For the analyzed empirical cases, the authors believe that the dynamic processes that best explain the cases in hand are knowledge acquisition and knowledge integration.

In the starting context in which the managerial knowledge is nonexistent within the nascent organization, the company needs to access this type of knowledge. From the standpoint of the company, most of the required knowledge is found in external knowledge silos and the company
needs to incorporate it in their knowledge resource base. Therefore, what is is being described is an inflow of knowledge. The concepts of knowledge transfer and knowledge sharing would not be appropriate since they describe an outflow of knowledge. Moreover, the notion of knowledge creation signals the generation of novel knowledge that did not exist before. In the studied cases, the knowledge that forms managerial capability is not novel knowledge but existing knowledge that needs to be absorbed by the organization, which rules out knowledge creation as a good description of the process. Finally, even when it is an inherent part of the process of absorbing new knowledge, learning in literature is approached as a complex process that involves abstract psychological and cognitive aspects that surpass the limits of this study and the concepts provided by the knowledge-based view. Therefore, it is argued that this process of knowledge inflows are better described through the concept of knowledge acquisition. Hence, mentions in the empirical study to facts such as learning new skills, realizations of new realities or new interpretations of circumstances will be approached in terms of knowledge acquisition concepts.

The second process that has been deemed as relevant to analyze the empirical information is knowledge integration. The selection of this knowledge process is less subject to discussion since it is the main concept provided by the knowledge-based literature to connect the individual scope with the organizational one, in the form of capability building. Moreover, the technologically complex products of the case companies demand deep levels of knowledge specialization that needs to be integrated in order to, not only develop the product, but also to commercialize it. Thus, as Grant posits, this would place knowledge integration as the core activity of these organizations. The concept of knowledge integration provides a platform to explain how the acquired business knowledge will translate into the managerial actions of the studied start-ups. Therefore, the empirical findings regarding decision making and interaction that lead to certain actions will be analyzed under the light of knowledge integration.

On the account of this, in this thesis it is argued that the dynamic process of managerial capability development may be conceived as an iterative two-staged process, in which the knowledge input results from knowledge acquisition and the managerial capability output is originated by a process of knowledge integration.
5.2 From Zero: Managerial Capability Emergence in the Verification Phase

This section will describe the initial stages of the managerial capability development in the three case companies during the verification phase. The knowledge-based view posits the centrality of knowledge as a primary resource for organizational development. The case companies studied in this thesis are originally formed by a group of novice entrepreneurs with a deep specialization in the technological knowledge domain and a complete lack of knowledge in the business side of the equation. Therefore, it could be argued that in this stage they do not have the necessary knowledge stocks that lead to managerial capability. This situation is illustrated in the Figure 14.

![Managerial capability](image)

*Figure 14: Knowledge assets of the start-up in the beginning of the verification phase*

In the coming section it will be analyzed how the case companies acquired new knowledge and subsequently, began the process of integrating it through the organization. In this verification phase, the goal is designing and consolidating a scalable business model. Therefore, the attainment of that goal will be studied based on the processes of knowledge acquisition and knowledge integration that were argued to be involved. As it has been pointed out in the empirical study, Graphensic never left the verification phase before leaving the incubator and their case will therefore be commented only in this part of the analysis.
5.2.1 Knowledge Acquisition

This section will analyze how the knowledge acquisition process was manifested in the three case companies in the first stage of their development. The acquisition process, i.e. the inflows of previously lacked knowledge, is done through several different mechanism which will be analyzed against the behaviours and actions of the case companies in this thesis. Recalling from the theory, five different types of mechanisms regarding knowledge acquisition were presented; (i) congenital knowledge, i.e. the current individual knowledge stock, (ii) Experiential learning (iii) Vicarious learning, i.e. acquiring second-hand experience, (iv) Grafting i.e. accessing new knowledge by recruiting and (v) Searching and noticing which refers to the process of implementing a focused search for change and opportunities.

It has been said that tacit knowledge is the precedent of any explicit knowledge. Therefore, it is to be expected that this initial phase that sets the ground for further knowledge incorporation has a strong component of tacit knowledge acquisition. The most important tacit knowledge acquisition process that was evidenced in the cases was that of ‘experiential learning’, which does not come as a surprise since (i) experience is the source of tacit knowledge and (ii) business knowledge is largely tacit since it is mostly based in situational know-how. The experience of actually trying to run a business provides a framework for incorporating and apprehending new business information. The broader the experience, the larger the platform that allows acquiring new business knowledge, both tacit and explicit. More specific to the verification phase, the cases showed that in this phase the main piece of knowledge that needs to be acquired is the so called ‘business mindset’. A mindset could be characterized as a bundle of tacit knowledge since it consists of hunches, intuition and fundamental beliefs that help the individual to interpret the world. Changing a mindset implies thus an incorporation of new tacit knowledge that replaces or complements previously held tacit knowledge. Many interviewees characterized the business mindset as being able to think about business from the customers’ perspective. The recurrent mention to the importance of meeting and talking to the customers as the only way of acquiring this new mindset reflects that ‘experiential learning’ is fundamental to achieve it. Without it, the individuals are less permeable to the inflows of business knowledge. A proof of this is the fact that Lundquist - CEO at SenionLab - expressed that the coaching and courses he received before the actual foundation of the company were not helpful since he could not grasp what the business terms really implied.
The incubation period at LEAD is designed to rest on two legs; the personal coaching and the courses and modules focused on, for example, sales and pitch training. These two main components involve both acquisition of tacit and explicit knowledge. As mentioned before, coaching is a way of reinforcing experiential learning since it is based on feedback that springs a second loop of learning. Bengtsson mentioned that in the verification phase he tries to provide constant feedback to the whole founding group by the constant reminder of the centrality of the customer, which drives the coachees’ process of change from a scientific mindset to a business mindset. However, in the verification phase the coach adopts a role which is similar to that of the project manager telling the coachees what to do. Therefore, in this stage the coach is to a great extent a source of explicit knowledge in the form of specific instructions about the actions that need to be performed in order to design a scalable business model and to set the foundations of a running organization. Similarly, the courses are a source of explicit knowledge as well since they are based on codified information that is transferred to the students. Therefore, the incubation process provided by LEAD could be characterized as consisting of (i) reinforcement of experiential learning through feedback and (ii) vicarious learning through the second-hand explicit knowledge provided by the coach and courses.

In the studied cases, one notable paradox in the acquisition processes was found: the congenital knowledge in a field may hinder experiential learning in a contrasting field. Many of the interviewees brought forward that the depth of their technological specialization resulted in difficulties in understanding issues regarding their business. As presented by Huber (1991), the knowledge stock one holds from before can be helpful in starting a new company. However, in the studied cases in which start-ups were founded by individuals with a large stock of specialized knowledge in one area, it actually resulted in the opposite. The congenital expertise carried by the most accomplished researchers reduced the efficiency of experiential acquisition since it reduced the willingness of the learning subjects to be involved in processes that implied a change of their fundamental beliefs, namely their mindsets.

Since acquiring this tacit knowledge is done through experiences and 'learning-by-doing', this implies that this process is active constantly when the entrepreneurs are dealing with their company’s day to day challenges. However, since experiential learning often comes as a result of a ‘need-to’ basis, this suggest that the more time and involvement spent with the start-up, the more tacit knowledge is acquired and thus, the knowledge from the coachees can be more effectively used. One of the problems identified in Graphensic was this lack of involvement which
may have led to that the founders did not acquire the necessary tacit knowledge. The lack of involvement was a result of a disinterest in business and hence, also a reticence of replacing their current mindset with one being business focused. Nonetheless, as was described by Jonas Nilsson, forcing a researcher to become an entrepreneur will just lead to an unhappy entrepreneur and the loss of one good researcher. Therefore, even though the experiential learning is in itself a very efficient tacit knowledge acquisition process, it requires that the individual is open for receiving it.

Moving our focus to Kulipa, they easily accepted this mindset change even though outreaching to customers was a part that felt scary for them in the beginning. Looking at SenionLab, the CPO stated that having a background as a researcher may not be an advantage since it requires a large “slap in the face” in order to start to understand a new way of thinking. Compiling all what was said about the change of mindset together with the theory of acquiring tacit knowledge, it can be suggested that the deeper the specialization within a technical subject, the harder it will be to acquire the necessary tacit knowledge. Even though the experiential learning process is the most effective one for achieving this tacit competence, the process may be restrained the deeper the specialization of the individual.

The deep congenital knowledge and the barriers to experiential learning implied that the best solution for Graphensic was to employ someone like Jonas Nilsson. This can be translated into acquiring his business knowledge through ‘grafting’. Even though he just worked for the start-up one day per week, he still laid the first foundation of knowledge to the firm. Nonetheless, later on in the verification phase of Graphensic, they managed to utilize the process of both experiential learning and vicarious learning through the collaboration between the external CEO Ali and Nilsson. Initially, the knowledge acquisition between Ali and Nilsson came in the form of more vicarious second-hand knowledge where Ali in broad terms learnt what Nilsson knew. Later on, the meetings they had once a week became more feedback-based, as Ali got more comfortable in his position as CEO. These meetings then resulted in feedback loops, where Ali came with wonderings regarding issues and possible courses of action and sought the advice from Nilsson. This feedback dynamics is a catalyst for tacit knowledge since the feedback given from Nilsson clarified the cause-effect relationship for Ali. Therefore, the tacit knowledge development was made possible later in the Graphensic’s development when Ali came in with an open mindset. It can be suggested that the slow growth experienced in Graphensic may thus be ascribed to the
lack of tacit knowledge development, which then would be directly connected to the resistance the researchers felt towards changing their mindset.

The next acquisition mechanism found to be essential in the early stages of the case companies was that of ‘searching and noticing’. This process was described in the theory chapter as searching in the market, or in a narrow segment, in order to spot changes coming in the form of opportunities or problems. When thinking of what that search would imply in practice, it is clear that it aims to arrive at the same result as the verification phase used by LEAD. According to Bengtsson, the verification phase circumvents the notion of searching: searching for what the exact customer need implies and searching for the appropriate target market. This is consistent with the definition of start-up as an institution on the search of a scalable business model. Both Kulipa and SenionLab spent a rather long period of time utilizing this process. Kulipa aimed at finding out exactly what the restaurants wanted in terms of a mobile ordering platform and SenionLab searched for one market segment for their product, but came to the realization that the indoor positioning market does not have one single homogenous segment but several. A company that spent a very long time with the process of ‘searching and noticing’ is Graphensic, who are searching for a commercial target market for graphene. Even though they today have a business model feasible for the research market, it will be essential to be able to find new applications for graphene in order to be able to implement a more commercially viable business model.

Since the case companies started off their journey with a nonexistent stock of business knowledge, the priority for this first developmental stage hence was to acquire this necessary knowledge in order to complement the deep technological expertise. The change to a business mindset is the fundamental knowledge acquired in this stage since it represents the platform of tacit knowledge that allowed the subjects to further enlarge their business knowledge assets. In other words, the knowledge acquisition process is intense and of greater importance in the verification phase of the start-ups. It implies a first approach of the start-ups to thinking about their product in business terms and an accelerated process of filling their large knowledge gap in order to be able to build that business.

5.2.2 Knowledge Integration

The study of knowledge integration implies the search for organizational actions that involve the application of several individuals’ knowledge. As discussed previously, in this early stage of
development the aim is to refine the idea and set focus on the customer needs and customer segments, and the purpose is to come to a position in which a complete business model is in place. Therefore, the kind of decisions and resulting actions that can be expected from this phase regard determinations in terms of the definition of the business boundaries and activities.

As stated in the previous section, the coaching that helps the founding group to come to these definitions is not exclusive to some of the members but includes the whole group. Thus, it may be argued that the required insights and knowledge to structure the business model is part of the ‘common knowledge’ shared by the group. However, given that the functions are divided among the individuals from the beginning, the different experiences they obtain may lead to specialized understandings that are incorporated in the main activity of this developmental stage. Moreover, as commented by Bengtsson, in this phase the coach gets directly involved in the company and takes a role similar to that of a project manager. The coach’s involvement then, represents as well a body of specialized knowledge. The presence of distinct competences and fields of expertise brings about the need of integrating knowledge. The direct involvement of the incubator coach in this process is an important characteristic of this phase.

If the characteristic of an organizational capability is that it is an repeatable activity that yields value for the company; structuring the business model that will lead the actions of the company is one of the major steps in managerial value terms. However, given that this is a very early stage of development that intends to be short and finite in time, the ability to do this repeatedly is yet to be proved. Hence, it may not be possible to argue that the activity that characterizes this stage displays the existence of a well-developed capability. That is why the authors deem more appropriate to consider this stage as one in which the managerial capability is emergent. In accordance with that, discussing knowledge integration in terms of its efficiency does not bear significant relevance for this phase.

Knowledge Integration Mechanisms

Both LEAD and InnovationskontorEtt pushed the case companies to craft their business model based on the Business Model Canvas. This model could be characterized as a template that guides the thinking process by providing a guideline on what is important to think about. In terms of the present analysis, this model could be conceived as a knowledge integration mechanism in the form of ‘rules and procedures’ that supports the integration of the knowledge acquired through ‘searching and noticing’. It is an explicit expression of business knowledge that aided the
coordination of the founding groups’ decision making in terms of the categories that needed to be included in their business model design. In this early stage, all three companies went through this process presenting a similar pattern of action.

In terms of the decision upon the content of each category, another knowledge integration mechanism could be identified. Given (i) the low number of members, (ii) their personal closeness and (iii) the novelty and complexity of the task, in all three cases it was seen that the most prominent knowledge integration mechanism used in this stage is ‘group problem solving and decision making’. Interviewees from each of the case companies mentioned how in this stage decisions were made upon group discussion and debate. This mechanism is based on personal and frequent communication and interaction. As mentioned before, in the verification stage the communication tends to be very direct and personal since everyone sits in the same room, which favours the effective knowledge integration using this method.

It is worth commenting as well, that in this stage when the level of business knowledge specialization is low, the common knowledge base of the founding groups is broad, favoring the efficiency of integration. The founding groups come from the same knowledge background and the amount of acquired business knowledge is yet too low to speak about the existence of the ‘semantic boundaries’ mentioned by Carlisle (2004) that hinder knowledge integration.

**Knowledge Integration at Graphensic**

Since Kulipa and SenionLab succeeded in designing a scalable business model, the process of managerial capability development continued in the growth stage and therefore, it will be further discussed in the next section. As it is already known, this is not the case of Graphensic. This case presents interest insights on the topic since it offers a description of how a company struggles to develop without having yet found a clear track to do so. As commented previously, since this case belongs entirely to the verification phase it will be commented under the light of the theory about knowledge integration only in this section.

In order to structure the analysis in an understandable way, a temporal approach to events will be adopted. The first scenario that can be studied is the short period of time in which only the three founders formed the company. In this context, the prospects seemed very similar to those faced by the other two case companies, namely a group of people with the same background using the direction of the Business Model Canvas to help them make sense of the task of designing a business model. The more intense coaching that they have to receive in order to succeed compared
to the other two cases, could be understood as a predominance of explicit ‘direction’ as knowledge integration mechanisms over group discussion. What this may be pointing out is that the more rooted the specialized knowledge and the less openness of individuals to alternative “thought worlds”, the more necessary it becomes to generate actions from mechanisms based on clear instructions rather than the individuals’ own interpretations of the environment.

Further on in time, Nilsson was incorporated to the original group, though also with limited involvement. This implied the first big division of individual specialized knowledge assets. On the one side it was the founders with rich and deep knowledge about graphene, and on the other hand it was Nilsson with a strong business acumen. While Syväjärvi remained involved in market aspects by being in charge of receiving orders, the other two founders retreated to focus on the production. However, all the internal management decisions and actions were performed exclusively by Nilsson with the support of Bengtsson, the business coach. This polarization of knowledge produced a scenario where both functions worked rather independently with the exception of communicating the receipt of a graphene sample order to the production team. The weekly meetings organized by Nilsson to bring the founders on board to the commercial side were rather futile and tended to focus on research rather than on markets. This could be interpreted as a lack of significant levels of common knowledge which implied in turn the lack of a common platform in which all the individuals involved could efficiently participate in managerial actions. This fact can also be interpreted as the existence of high semantic boundaries, in which problems of interpretation exist because people develop understandings about the world in different knowledge contexts and thus, the sender and receiver differ in the meaning they attach to events. Given the lack of interest of the founders to become business experts, this arrangement in which the interaction of the business and production spheres worked rather independently was Graphensic’s way of reconfiguring its work to assimilate the new specialized business knowledge.

With the introduction of Ali as full-time CEO absorbing all the sales activity from Syväjärvi, this polarization between the two thought worlds became stronger. As he pointed out, all managerial decisions are done and performed by him, though oftentimes consulted with Nilsson. Together with the CEO a board of directors was formed. However, it is formed by the founders, Nilsson and Ali. Hence, the only contribution of having this board of directors is that it provides an occasion to all involved members to meet in the same room. But the contribution of the founders to the enhancement of the managerial tasks is very limited due to their lack of expertise in the
field. So it may not be possible to argue that in this case the board of directors provides a platform for higher level managerial capability development.

![Managerial capability hierarchy in Graphensic](image)

Figure 15: Managerial capability hierarchy in Graphensic

After the previous discussion, the pertinent question now is if it is possible to speak about the efficient knowledge integration in the case of Graphensic. Knowledge integration was defined in the theory as an on-going collective process of constructing, articulating, and redefining shared beliefs through the social interaction of organizational members. The lack of significant interaction and understanding between the individuals that carry the two types of knowledge shows that the only integration mechanisms that works in this case is ‘sequencing’. The first step is that the CEO creates the sales opportunities, and the second one is producing the graphene to deliver that order. The prospective growth that the company is expected to have in the future would require that this mechanisms is complemented by other mechanisms that involve more interaction, in order to align both knowledge spheres in the development of the required capabilities that a more complex business would demand.

### 5.3 To Hero: Managerial Capability Development in the Growth Phase

Once the companies established a business model that has the potential to support a scalable business, they move on to the growth phase in which the focus is to swiftly grow the operations. In order to do this, the continuous development of managerial capability is fundamental. It is the
primary resource that will power such growth. As previously stated, both Kulipa and SenionLab succeeded in moving to this stage, thus their cases will be described in theoretical terms in this section.

Again the process of capability development will be explained in terms of knowledge acquisition and knowledge integration. These processes in the growth phase present distinct characteristics that differ from those noted in the early phase of verification. Not only each process itself is dissimilar but also the comparative weight and importance between them is different in this phase.

The intention of the authors is that after this section, the reader will have obtained an understanding of the process of managerial capability development, the differences between developmental stages as well as the differences between each case. These findings will be at the grounds of the final propositions that were promised in the purpose of this thesis and which will be presented in the following and final chapter.

5.3.1 Knowledge Acquisition

It was discussed earlier that the knowledge acquisition process is predominant in the verification process, due to the pressing need of obtaining business-related knowledge. However, the need of acquiring knowledge still remains significantly important when the start-up begins to grow. Since the growth of the organization is a process that will last indefinitely, it further requires a constant enlargement of the knowledge stocks.

Unlike the verification phase, in the growth stage it can be seen that one person in the original group is singled out and act as an acquirer and gate-keeper of the incoming flows of business-related knowledge. This individual is usually the CEO. The incubator stops being directly involved in the activities and acts through the formation of this individual. According to LEAD, this approach is important in order not to undermine the role of the CEO and to start making the company more independent from the incubator so that it is better prepared to face the post-incubation period. Hence, it can be suggested that in later stages of the start-up development, the acquisition of business expertise is focalized on a single individual. This is visible in several aspects; the coaching being the first one. In the growth phase, even when the courses and modules are still open for everyone who is interested, the business coaches only meet with the CEO. Contrary to the verification phase in which the coach was more a provider of explicit instructions, in this phase the main process of knowledge acquisition is the reinforcement of the CEO’s experiential learning through the feedback they provide. However, being as experienced as
coaches are in the field of business development, the coaching naturally also implies conversations in which a significant amount of explicit knowledge is acquired in the form of tips and advice, i.e. implying 'vicarious learning'. The knowledge acquired from those coaching meetings will then be part of the specialized business knowledge that the CEO brings to the company. The interviewed CEOs also recognized that they try to reinforce their business expertise with their own initiative to study from external sources, such as books and online resources. However, the contribution of this source of vicarious learning was described as less important.

This dynamic is seen both in Kulipa and Graphensic where it is Södermark and Ali that have the predominant role in developing specialized business knowledge, which then will be brought to the company as a complement to the already existing technological knowledge. Due to the larger size of the organization, SenionLab takes a slightly different form even though it is based on the same premises. Lundquist as the CEO receives the coaching, and is the main repository of specialized business knowledge among the founding group members. However, the CPO Jonas Callmer, also gets business coaching from LEAD. His role is intended to function as a bridge between the technological and business knowledge bodies and hence, his role requires an ambidexterity of thinking in terms of both thought worlds. What he acquires in term of business knowledge in the coaching meetings is used in order to align the product to the market. In order words, Lundquist is singled out as the individual learner in terms of business knowledge for the entire organization while Callmer is singled out as a first factor of balancing the knowledge equation by focusing on the product development side.

As expected, when companies reach the growth phase, more knowledge is required to cope with the accumulating workload and thus 'grafting' becomes increasingly important for all the case companies. Every 'grafted' individual is a silo of both explicit and tacit knowledge, so the incorporation of new talent imply access to stocks of both explicit and tacit knowledge in different fields of specialization. The grafting process is apparent in all three cases. The first recruitment done by Kulipa was a sales representative who was hired in order to be able to reach out to more restaurants. This enabled the founders to let go of part of the sales tasks and focus on their respective area of responsibility. SenionLab has been the organization utilizing 'grafting' to the greatest extent, with several employee additions the last year where most of the new positions are within the business side. As aforementioned, Graphensic realized the importance of external knowledge already from the beginning when recruiting the business consultant. However, in order to take the next step towards growth it was necessary to hire someone that could put all focus on
business related activities and for this reason Ali was recruited. Another source of knowledge acquisition by ‘grafting’ in this later developmental phase is the formation of the board of directors. The board members are recruited as part of acquiring great amounts of business knowledge from outside the company. As stated by Fornell, this is an efficient way to fill knowledge gaps by incorporating highly skilled people.

Figure 16 is a representation of the above mentioned facts and thus, it shows how the process of knowledge acquisition may be conceived during the growth phase of start-up development.

A fact worth noting, is that theory predicts that one of the most important sources of knowledge in an incubator is learning from peer companies. i.e. learning from second hand experience. Even Gio Fornell, the innovation counselor at InnovationskontorEtt, said that ‘learning from peers’ probably would be considered as one of the most important aspects of learning in the incubator. However, this aspect was not brought forward by the case companies even when asked directly about it. Though the physical proximity between the start-ups may have been useful in a few cases, it therefore cannot be considered as central.
5.3.2 Knowledge Integration

The above mentioned process of business knowledge acquisition through experience reinforced by coaching and through hiring expertise sets the ground for a context in which knowledge specialization is more developed. One or two individuals from the leadership group have been singled out to be the carriers of the specialized business knowledge together with the newly incorporated specialists and, in order to translate that into organizational managerial capability, a knowledge integration process needs to take place. The result is the situation illustrated in Figure 17. This section will develop the right side of the process, namely the knowledge integration that forms the managerial capability.

![Knowledge Integration Diagram]

Figure 17: Process of managerial capability development in incubated start-ups

In the case of Kulipa, the CEO is the strongest repository of business knowledge and could be conceptualized as the company’s gate-keeper for that sort of expertise. In this phase, the coach Lars Bengtsson retreated from the involvement in the daily operations and became mostly a source of feedback from which the CEO reinforced his experiential learning. The business knowledge silos in SenionLab may be found in the CEO, the CPO and in the new incorporations in the sales and customer service division. Similar to what happened in Kulipa once the company reached the track to growth, in SenionLab the business coaches started having a more indirect role as well.
Therefore, it could be argued that the role of the business coaches in this phase belongs to the knowledge acquisition process. Their contribution to knowledge integration is indirect since it happens through the expertise they help to build in their coachees. This shows how the company starts to become more independent from the incubator as knowledge assets are built.

**Knowledge Integration Mechanisms**

Erik Södermark, Kulipa’s CEO, mentioned the process through which daily activities are planned and decisions are made. He described that the company stays aligned through holding weekly meetings in which the organizational members discuss the activities for the week that Södermark has pre-designed. In this meetings he intends to bring everyone on board on what happened the week before, what is happening now and opens the discussion to decide upon what needs to be done the incoming week together with a determination of everyone’s responsibilities to make it happen. This could be seen as a knowledge integration mechanisms that combines elements of both ‘directives’ and ‘group decision making’. The leadership role that the CEO holds gives him the authority to pre-determine the priorities, which could be conceived as a way of putting in explicit terms what he believes to be right for the business. In the meetings this is subject to the discussion in which consensus will tried to be reached about what activities need to be performed. Theory considers this mechanism to be the less efficient since it requires a lot of communication, interaction and thus time. However, in the case of Kulipa this happens in a rather homogeneous group of three people, with low barriers for communication, high levels of trust and who work physically side by side. Therefore, the inefficiency proposed by literature may not be a hinder in this case. Moreover, these facts suggest that for Kulipa the knowledge integration process may consist in one step, namely moving from the individual knowledge level to the organizational functional capability through the previously mentioned mechanisms for integration. This is illustrated in Figure 18. The striped box represents the dual nature of the knowledge specialization of the CEO.
By the time of the empirical recollection, the newly hired business specialist had been in the company for less than a week. In consequence, it may not be possible to state with an acceptable level of certainty what is his role in the knowledge integration process in this late phase of incubation. Conceptualizing his role in this case will be closer to guesswork than solid analysis.

In contrast with Kulipa, SenionLab presents a higher number of organizational members who work in a more divisionalized functional structure. The role of the CEO is to oversee all the operations, being the head of sales, recruiting the talent needed to do so, finding the required funding and most of all making the decisions that guide the overall prioritization of activities. Responding to the duality of the required knowledge in a start-up, in SenionLab there are two main functions. On the one side there is the product development function and on the other side the sales and customer service function. As described by the CPO himself, his role is to be a bridge between the two by providing inputs to the development team on what the market may want so that the product responds to the customer needs. It could be argued that this represents a context with two levels of integration. The first one is between the developers and the CPO in which a highly specialized technological knowledge is combined with managerial market knowledge and the result is the development of a marketable product. The second one is leaded by the CEO and includes the CPO and the sales and customer service employees and which aims at the goal of company building through internal organizational development and market success. The presence of different specialized knowledge domains may not be as antagonistic as it was for example in Graphensic. This could be explained due to the incorporation of individuals that carry
both types of knowledge in the two main functions, which is represented by the striped boxes in Figure 19.

![Managerial capability hierarchy in SenionLab](image)

Unlike Kulipa, the knowledge integration mechanisms may seem not to be predominantly based on ‘group discussion and group problem solving’. The number of organizational members is higher, the product is more complex to be understood by any newcomer and the organization has a better-defined structure. To correspond to this, the main knowledge integration mechanism is ‘direction’ coming from the more hierarchical organizational structure. The directions are based on explicit business and technological insights that are constantly communicated between the two functions. It may also be argued that within the leadership group there is some evidence of ‘group problem solving’, but it is the CEO who ultimately will make the decision of what needs to be done.

The studied cases may suggest that in organizations with low complexity and high interaction the predominant mechanism is ‘group problem solving and decision making’. With higher levels of complexity, ‘direction’ as an integration mechanism prevails to achieve coherence and alignment in the company.

**The Role of the Board of Directors**

As mentioned before, the board of directors is a way of acquiring knowledge through grafting and feedback for the CEO. However, the meetings of this organism is not only a source of
knowledge for the entrepreneur but also an instance in which decisions are made for the companies.

The role of the board of directors in terms of capability development is similar for both companies. The interviewees both in Kulipa and SenionLab agreed on that the decisions that are made on those meetings aim at designing the long-term future goals of the company. Thus, the result rather than actual actions is more a framework that helps the CEO understand the fit of the daily operations with those long-term strategies. That is how the knowledge of the board is integrated to form managerial capability. After a process of group discussion and decision making in which the knowledge of the members of the board is integrated to form a strategic framework, it could be conceived that this strategy becomes integrated into the company through a the mechanism of ‘direction’. It provides the structure which will guide the managerial actions and thus managerial capability development in the company.

**The Efficiency of Knowledge Integration**

As mentioned in the theory chapter, the efficiency in the development of capabilities is determined by the level of common knowledge, the frequency and variability of the task performance, and the structure.

The ‘level of common knowledge’ in both cases could be considered as high. In Kulipa, the fact that they are few and that most of them share the same background in computer engineering generates that everyone is on the same frequency, so decision-making is quite easy. “We overlap pretty much in every aspect”, said Södermark. This may as well explain the high reliance on group problem solving as integration mechanism, since the broad common knowledge makes communication unproblematic.

In the case of SenionLab, even when there are two very distinct bodies of functional knowledge, the fact that the individuals holding leadership positions are able “to think both ways” as they say, implies that in the field where decisions are made the level of shared knowledge bases is broad. They act as translators between the codes, symbols and languages from each ‘thought world’. They recognize that if this ambidexterity would not exist, the cross-functional communication would not be as smooth. However, when Callmer - the CPO - expresses that he believes that developers should also get certain degree of market competence, he reveals that he may see the need of expanding the level of common knowledge.
The high level of common knowledge favors the managerial capability development since there is little knowledge loss in the communication between the organizational members. The communication can be done on the basis of a broad common language and broad common tacit understandings. The importance of the role of the ambidextrous individuals in key positions is of high importance. These individuals enlarge the levels of common knowledge required to connect both thought worlds and integrate them in a flourishing business. The absence of such individuals in Graphensic’s case may explain the high ‘semantic barriers’ that were found.

In terms of the ‘frequency and variability of task performance’, it may be argued that the rather chaotic and uncertain context that the start-ups face makes the task variability high and performed in an irregular and unplanned way. When asked about their job descriptions, one interviewed CEO replied that every day looks different and that the guiding principle is just to do what it needs to be done in that particular moment. This explains why the companies base the knowledge integration process mainly in ‘directive’ and ‘group decision making’ mechanisms since they are the most suitable methods to navigate through uncertainty. Moreover, the lack of regularity of tasks prevent the emergence of ‘organizational routines’ as an alternative mechanism.

Finally, in order to yield an efficient knowledge integration process, the structure must correspond with the architecture of capabilities. The authority and scope of work of individuals must be designed in order to minimize the costs of coordination of knowledge. Since the focus of this thesis is managerial capability, what this implies for this study is that the key actors with relevant knowledge need to be in a position in which they are able to influence and oversee the process of company building. In the case of Kulipa where the transformation of individual knowledge to organizational capability is a one-stage process, the structure fits by having two levels: the CEO on top, and the rest of the members in the next level of authority. The structure of SenionLab responds as well to the knowledge integration process. The highly specialized individuals work together and the individuals with the dual knowledge that serve as the link between them are in leadership positions with authority which aid the mechanism of direction.

All in all, it can be said that the companies present positive levels of the attributes that are connected to efficient knowledge integration, which in turn implies that they are in a good position to effectively develop the managerial capability that supports growth. The fact that in the last year of incubation both companies more than doubled their operations may confirm that this is the case.
CHAPTER 6: Conclusion

This chapter symbolizes the end of the reasoning cycle that started with the introductory chapter. Its goal is to condensate the findings from the previous chapter in order to construct the propositions about the development of managerial capability in incubated start-ups which were promised in the purpose of this study. The focus has been set on the need of complementing technological knowledge with business knowledge that is required to build a company based on a technological product. In order to explore this process from its origins, the study focused on start-ups founded by novice entrepreneurs with backgrounds in fields other than business administration and management.

The chapter will be divided in two sections. The first one consists of the description of the propositions that form the output of this thesis, while the second part will account of managerial implications that arise from this study.

6.1 Delivering the Purpose

The explorative nature of this study makes these propositions a first approach as to how this process may be tackled conceptually, by identifying relevant processes, actors and the plausible interplay between them to drive the development of the start-up.

The process of managerial capability development in incubated start-ups may be deconstructed into two knowledge processes: knowledge acquisition and knowledge integration

Managerial capability is the ability to repeatedly perform tasks that combine technological and business knowledge in order to build a business that provides for a need with a product or service. In the case of start-ups founded by individuals with extensive technological knowledge, the business side of the knowledge equation may be deficient. In order to solve this deficiency, the company has to first acquire that knowledge from diverse sources. Those knowledge inflows are both of tacit and explicit nature. Once the company has acquired the business knowledge, it has to be combined with the technological knowledge through a process of knowledge integration in order to form managerial capability.
The relative importance of knowledge acquisition and knowledge integrations shifts between developmental phases

The verification phase is a stage in which the main focus is in filling the business knowledge gap in order to achieve a balance in the knowledge base. The knowledge integration process is in an emergent stage and its main result is the design of a business plan that will guide the managerial capability development in further stages of organizational development. In the growth phase, the focus shifts to knowledge integration since the goal is to develop the managerial capability that will support the growth of the company. The knowledge acquisition takes the form of hiring external talent and underpinning and reinforcing the experiential business learning of the start-up leaders. However, the inflows of knowledge this process provides are important to continuously enlarge the start-up’s knowledge assets.

Individual experiential learning is a key knowledge acquisition process and it is complemented mainly by grafting and vicarious learning

Business knowledge implies first, a specific way of thinking, and secondly, the know-how required to make decisions and solve problems in the face of uncertainty and risks. This makes it a largely tacit knowledge domain. Consequently, its acquisition will predominantly rely on the direct experience of the learning individual. However, even when it is reinforced by coaching feedback, it does not develop as fast as the companies grow. Therefore, it has to be complemented by other acquisition processes. In early stages of incubation, vicarious learning is the main supplement. In the growth stage, these two processes of knowledge acquisition are further strengthened by grafting new employees and a board of directors.

The depth of the previous knowledge specialization affects the development of managerial capability

Having deeply rooted congenital knowledge within an area of specialization may represent a hinder to the process of learning from experience since it reduces the willingness of the learning subjects to question their fundamental beliefs. If the novice entrepreneurs are to be the ones to run the start-up, their previous knowledge assets must present a certain flexibility that allows them to absorb and complement different domains of knowledge. In order words, they have to be able
to switch their mindset into thinking in business terms. This may be less likely to happen if the entrepreneurs have deep expertise and find their motivation and drive in working only with one side of the knowledge equation. Conversely, the acquisition of new different knowledge seems to be easier when the level of specialization is lower, as in the case of students. Moreover, the level of knowledge specialization will determine the strength of the semantic barriers that obstruct the communication and interaction required to coordinate different individual specialized knowledge.

**The intensity of use of certain knowledge integration mechanisms varies according to the level of development of the start-up**

In terms of the knowledge integration mechanisms, the studied cases suggest that in organizations with low complexity and high interaction the predominant mechanism is group problem solving and decision making. With higher levels of complexity, direction as an integration mechanism prevails to achieve coherence and alignment in the company. Moreover, Graphensic’s case seems to suggest that sequencing as an integration mechanism is used when the overlapping and cohesion between the two thought worlds is very low. The lack of evidence in terms of routines as knowledge integration mechanisms may suggest that in the uncertain environment of the start-ups and the consequent unpredictability of their tasks prevents the emergence of predicted patterns of organizational behavior.

**Ambidexterity is a valuable resource to efficiently form managerial capability**

The importance of the role of the ambidextrous individuals in key positions is of high importance. These individuals enlarge the levels of common knowledge required to connect both ‘thought worlds’ and integrate them into a flourishing business. The absence of such individuals in Graphensic’s case may explain the high semantic barriers that were found.
The business incubator fulfills its role through their contribution to the knowledge acquisition process

Though initially involved in the knowledge integration process, the role of the incubator has been identified to be as a kick-starter and main source for the knowledge acquisition process. In general terms the business incubators are created to guarantee the likeliness of survival of risky start-ups. This study suggests that through coaching and providing courses they fulfill their mission by filling the knowledge gaps that would prevent the companies to develop the managerial capability they need to survive.

The process of managerial capability development in start-ups is an incremental process that drives growth

Finally, it also needs to be noted that this succession of knowledge acquisition to knowledge integration is not a static event but rather a continuous process that circles in repeated loops. Knowledge integration cycles occur in the daily operations and actions of the companies that are powered by the increasing stocks of specialized knowledge in both fields facilitated by knowledge acquisition. This incremental process is what may be considered to drive the growth of the companies.

6.2 Managerial Implications

This section represents the normative conclusion of this thesis and will aim at outlining some practical uses of the previously listed propositions.

Thinking about start-up development from a knowledge perspective brings about the need to think about the company’s competitive advantage in knowledge terms. Thus, the first and more prominent implication for management is that the focus on managerial capability building has to be a central element of the process of strategy design. It implies that the management needs to have a clear idea about the mix of knowledge assets of the company, if they are enough to support the business and if they are properly combined and coordinated.

If there are knowledge shortages, the problem should be addressed through thinking about the most suitable way of acquiring the knowledge that is lacking. If the need is urgent, the fastest way of incorporating the missing knowledge is through hiring new organizational members who
possess that specialized knowledge. However, if the solution allows for longer-term initiatives, it would yield more value for the company to make current employees go through processes of experiential learning and enlarging their knowledge bases through training and coaching. This may be especially true if this process of learning happens in a knowledge field that is different from the individual’s previous knowledge base. These ambidextrous individuals would have the potential to become valuable resources for the company due to their broader expertise, even more if they are placed in positions with the authority to be the intermediary between different knowledge domains. However, before pushing an individual through such a learning process, the management should review first what are the individual’s personal drivers. Forcing a person to learn something that they do not enjoy as much as their previous specialized field may be highly ineffective and a waste of time, money and talent. This last observation is also valid for the business incubators when thinking about the support that is to be given to the incubatees.

If the knowledge is present but not properly coordinated, the solution may be found in the organizational structure. The structure must facilitate and rationalize the communication and interaction required to combine different domains of knowledge. This rationalization requires high levels of common knowledge and thus, as said before, placing ambidextrous individuals in leadership positions is of great value. Since start-ups are in the process of defining their functional structure, tackling the issue of designing a structure that responds to the knowledge combination demands before the structure is consolidated may be valuable for the company’s future. As the start-up grows and becomes a bigger company, it is expected that the functional complexity increases and with it, the need to combine more scopes of knowledge and in a higher number of levels. Having set proper grounds to do so from the very conception of the company, would probably put the firm in a better position to handle the increasing levels of knowledge integration complexity in a more efficient way.

Finally, from the incubator perspective, if their role is to be a source of business-related knowledge, then the fundamental importance of learning by experience in this field should not be overlooked. The chaotic and uncertain context of the start-up may make the entrepreneurs demand for direct support and intervention. But once the fundamental grounds of a business have been set, the incubator should make sure that the entrepreneurs go through an intense experiential learning process that will shape them into competent business people.
References


