# The Development of Capabilities during Firm Growth

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# THE DEVELOPMENT OF CAPABILITIES DURING FIRM GROWTH

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## Abstract

A major research strand within strategic management research views the firm as composed of firm-specific capabilities that may result in competitive advantages and firm growth. Most empirical and theoretical research within capability based strategy research focuses on established firms with inherited capabilities and examines the process of gradual change. Few studies have empirically explored the transformation of individual resources into organizational capabilities and the related firm growth from the very beginning. This paper explores and attempts to explain the transformation of individual resources into capabilities by using case studies set in the bioscience industry. More explicitly, this paper focuses upon the transformation and emergence of organization within growing science-based firms. Thus, the purpose is to explore if and how capabilities are formed from separate resources by analysing eight bioscience firms during their growth processes. The paper finds that a) the firms within the bioscience industry started with very different resource endowments, b) these firms were initially characterised by rather atomistic resources, c) the continued resource accumulation during further growth and expansion followed different pathways, d) the firms all went through a general processes of capability development, and that these processes were found within all these firms during firm expansion. These processes are here described by two broad themes. The first theme focuses around the processes leading to internal development of firm specific knowledge and an increasing specialization of individual employees. The second theme relate to processes around the development of a supporting context to the performed focal activities.

**Introduction**

The growth of new firms has become a vibrant area within economic and management research. Especially the growth of new technology based firms has increasingly received attention. Already Schumpeter described the important role played by the emergence and growth of new firms in relation to innovation processes (Schumpeter 1934). Growth difficulties for new firms have simultaneously long been recognized (Stinchcombe 1965). New firms often do not possess internal resources other than what the original entrepreneurs contributes with. In addition, especially for firms targeting to commercialize innovations, long and uncertain product development cycles severely affects the ability to mobilize additional external resources. New, small, firms hence suffer from range difficulties during their initial development and growth (Aldrich 1999).

A number of different theories have tried to explain the process of development and growth of new firms. Within these theories explanatory factors of the growing firm can broadly be found within initial, internal and external contingencies (Tether 1997). The paper focus on firm growth from an internal, capability based perspective of the firm (Penrose 1959, Spender 1996). Following an evolutionary paradigm, in which firms are selected by market processes, firm growth is seen as an emergent process of developing competitive advantage (Nelson and Winter 1982).[1] Advantages are thought to be rooted within the development of internal organizational advantages, inherent in the relationships between accumulated resources. An explicit focus on how firms initially construct capabilities is however largely missing within the literature. Even within entrepreneurship research interest in how the development of firms from a capability development perspective has been scant. Instead the focus within entrepreneurship research has been put upon opportunity discovery processes. This paper seeks to remedy this gap by developing a capability-based logic in relation to the development and growth of the individual firm.

The relationship between development of organizations and capability formation should be evident within studies of growing small firms. The aim of this paper is hence to develop a capability-based logic to in relation to the development and growth of the individual firm. The context of this study is the bioscience industry. This industry is a rapidly growing industry in which innovations, new firms and new knowledge is introduced. This industry has grown to a

[1] Selection usually refers to product market selection. However, particularly in cases such as bioscience firms, selection pressures are also prevalent in financial and labor markets.

substantial size since the first emergence of bioscience firms in the 1970s, by the growth and establishment of new ventures.

This paper is structured in the following way. Section 2 reviews the previous literature within capability development and states a research question. Section 3 presents our research design as well as a brief methodological discussion. Section 4 analyses our case studies while section 5 discusses the findings and concludes the paper.

**Theoretical Framework**

Theories around the specific relationship between capability formation and firm growth are largely missing. Specifically, an explicit focus on how firms construct organizational capabilities from scratch is within the entrepreneurship and strategic management literature relative rare. This is so even if the theoretical aspect of the competitive advantages generated by organizational capabilities by now is well established within main stream strategy research. Even within entrepreneurship research interest to study how the development of firms occur from an organizational and capability development perspective has been scant. The focus within main stream entrepreneurship research has instead been put upon opportunity discovery processes and the subsequent adaptations of the evolving firms. Further on, entrepreneurship research in general also focuses upon the entrepreneurial individual rather than the formation of the organizational aspects within the growing firm. New firms are created by entrepreneurs and their initial endowments. To achieve further growth and expansion additional resources must be developed or integrated within these emerging firms (Chandler and Hanks 1998). To go from the stages of an individual entrepreneur into a firm thus implies a process in which independent resources and activities are becoming organized. Growth of the firm must hence involve an aspect of the formation of the organization of activities and resources within the boundaries of the firm (Gartner 1988, Aldrich 1999)[2]. Studies of firm growth and development have stressed the variety in which new firms evolve (Bidhé 2000). Yet, the process in which a firm grows must be characterised by the gradual organizing of resources and activities within the context of a firm. Few studies have however been performed on growth of firms from the perspective of the development of organizational capabilities (Chandler and Hanks 1994, Mosakowski 1993, Brush et al 2001, Newbert 2005 Alvarez and Buzenitz 2001, Alvarez and Barney 2004). This missing link between capability

[2] Entrepreneurs has been claimed to be important not only for their ability to innovate and act upon perceived opportunities, but also due to their ability to create organizations within society (Low and MacMillan 1988).

formation and firm growth is intriguing. Using capability based theories of the firm to further understand the growth and development process of firms have been suggested earlier by for example Mathews (2002), Bromiley and Fleming (2002) and Montgomery (1995). The synthesis of entrepreneurship and capability based views of firm development has simultaneously been called for by Hitt and Ireland (2000).

According to the knowledge based views, the firm is seen as a social community for coordination and cooperation of knowledge gained through the replication of activities (Kogut and Zander 1992). The organizing of activities within the firm thus renders the firm with social and intellectual capital, creating an organizational advantage, for undertaking further activities (Nahapier and Ghoshal 1998). From this perspective firm growth becomes a process in which firms develop within an emergent process in which there is an organizational advantage by being ‘inside’ the firm. Firm growth thus occurs by building on the social relationships that currently exist in a firm. The growth of the firm becomes a path-dependent process of the development of organizational capabilities from initial and independent resources entities (Brush et al 2001, Aldrich 1999). Following the knowledge based view firms are formed in the very social process of organizing activities and resources within firm rather than across markets in order to act upon opportunities (Kogut and Zander 1992). The resulting organizational capabilities of the firm hence come out of the combination of individual resources such as assets and skills, together with collective behaviour such as rules and routines forming firm specific knowledge (Spender 1996, Grant 1996). The capabilities of the firm can hence be described as its systemic interactions among resources, which allow the firm to perform the different activities effectively. The evolved organizational capabilities result in an organizational advantage for the undertaking of activities, providing the firm with non-tradable social capital (Nahapier and Ghoshal 1998). There are thus not so much the individual, atomistic and separate tangible assets and resources, but the ongoing interactions within a social and systemic context that provides the firm with a specific advantage and a reason for the existence of the firm (Black and Boal 1994, Connor and Prahalad 1996, Mueller 1996). According to this view, the development of the organization of activities within the firm can be seen as a gradual process in which knowledge and resources is accumulated within the firm (Dierickx and Cool 1989). The knowledge based perspective thus emphasises the path-dependent process in which firms add and develop resources and capabilities over time (Mosakowski 1993, Pettus 2001). The endogenous creation of strategic resources within the firm is thereby related to a process of organizational learning, path dependency and evolved complementarities (Foss 1997).

The processes of growth of the firm can from the perspective of resources be seen in relation the internal accumulation and recombination of the resources (Penrose 1959). The main source for the emergence of growth (expansion) opportunities is accordingly the gradual learning process which occurs within the firm in relation to the organization of resources. Knowledge and capability development within the firm hence becomes an essential part in the growth and development of firms. As a result, the firm grows (expand) in a cycle of emerging excess of resources, perceived opportunities to (re-) deploy these inherited resources in combination with internalised external resources and managerial actions to exploit and take advantage thereof (Goshal et al 2000). Firms cannot grow without managerial actions taken to perceive and act upon opportunities. The growth of emerging new firms is usually seen as constrained by managerial motivation to undertake growth and their abilities to access additional external resources. The process of growth can thus be analysed as a relationship between access to additional resources and entrepreneurial perception of opportunities and managerial motivations to undertake further growth (Wiklund 1998).

According to the capability based view, an alternative explanation is that for these opportunities to result in further firm growth, they must be realized by integrating additional resources within the firm rather than realized across market transactions. Consequently, there should be a link between developments of capabilities within the organization and the growth process.

Applying a capability based view of the firm in relation to firm growth therefore shifts the focus from the problems around access and mobilization of external resources towards the processes of integrating additional resources and developing capabilities in order to understand the growth of firms[3]. The access or mobilization of external resources hence becomes subordinated to the process of organizing and integrating recourses into firm level capabilities. Priem and Butler (2001a, 2001b) emphasises that this process of transformation of independent and generic resources into specific competitive advantages has been rather implicit and underdeveloped within the literature. The ongoing developments of capabilities

[3] Nevertheless firms frequently grow by opportunistic acquisitions of ‘discovered’ assets.

have further on mostly been associated by ongoing change and competitive advantages within established firms[4]. Nevertheless, capability development should also be visible within the emergence and initial growth of rather small firms.

Our research question in order to understand the growth of bioscience firms from the perspective of capability development becomes: *What happens in terms of capability development as the biotechnology firms grow?*

**Research Method**

This study is based upon the retro-perspective analysis of the processes of capability development within cases studies of eight firms. These firms are located within both Sweden and Australia. In order to capture the development of capabilities within growing bioscience firms these firms were sampled out of the total population of firms active within the bioscience industry[5]. The study was limited to include only firms which had more than 20 employees, and an operating history of more than 5 years. This limitation was imposed in order to distinguish the endogenous capability development and firm growth processes from a too strong influence of the firms' initial endowments. The eight studied case firms were between 7 and 20 years old and had a maximum of between 20 - 150 employees. Empirically the focus is on the process in which capabilities are gradually built during the growth and expansion of firms. Technologically the firms were all active within technological development of modern bioscience within the segment of human health and diagnostics[6].

Empirical evidence of the developments of capabilities has been found within detailed case studies by for example Danneels (2002, 2005), Siggelkow (2001, 2002,) and Raff (2000). The fundamental points made by these studies are three. Firstly, capabilities are gradually developed through a process of learning and adaptation both collectively and individually. Secondly, the developed capabilities can be stretched or leveraged towards other perceived opportunities. There is hence not a strict one-to-one correspondence between capabilities of the firm and activities or product. Thirdly, capabilities are systemic and context dependent,

[4] Competitive advantage and current profits are however usually not seen as central to the growth of small, new firms. Empirically it apparent that firms may grow and expand, at least temporarily, without being profitable (Davidsson et al 2005).

[5] The definition used within this paper defines the growth of the firm through the number of employees.

[6] Different industrial areas within bioscience seem, according to the literature, to have a somewhat differentiated industrial development in which the growth of new firms has a less profound role. Within these sectors there is a lower entry of new firms, slower growth and a higher activity of large incumbent diversified firms (Prevezer 1997, Niosi 2003).

hence non tradable and therefore only leveraged by further organizational existence and growth.

In order to study the capability development building process during growth of bioscience based firms, a qualitative - case study, method was used. This study explicitly searches for the interconnectedness between capability development within firms and the observed growth. The focus is especially put upon why and how firm growth unfolds by an emphasis of historical dependencies upon past activities. As such it is important to identify the mechanism and causes of change in the relation to timing and sequence of events (Mckelvey 2004). The case studies were analysed in an open-ended event based chronological logic (Van den Ven and Pool 1995). The capability development process of the firm was analysed according to a process view, were causes and consequences where traced over the development of the firm. The analysis composed of process of initial case analysis and a final stage of cross case and pattern matching (Miles and Huberman 1984, Straus and Corbin 1998).

In order to identify the general processes of capability development during firm growth the evolution of the eight firms were analysed. The empirical focus was firstly set upon both the constituting salient resources and the related activities, both at the time of the initial foundation, and at a point later in time at which the firm had grown substantially. Starting with analysing the individual, salient, resources during growth according to a methodological individualistic approach reduces the risk of reifying the capability concept. In addition to resources, focus was also put upon the processes occurring around the development occurred within the studied firms. By being derived from the different cases studies these empirically grounded constructs contains inputs from multiple cases. Amalgamating the different case studies around common constructs resulted in the derivation of the processes of development occurring during the growth of these studied firms.

In the first analytical stage data from each case firm were compiled with respect to the timing and unfolding of events with focus on six resources categories according to a research design developed by Bergmann Lichtenstein and Brush (2001). The definition of resources was based upon constructs which were developed according to Grant (1991). Consequently the developments of financial, physical, technological, human, organizational and relational resources were identified within the evolution of each firm. The operationalization of resources is thereby not focused upon the strict attributes of strategic resources, as in mainstream research within the resource based view, such as being valuable, rare inimitable and non-tradable, but upon resources deemed vital, salient, for the further activities and development of the firm[7]. In a second stage the evolution of these firms in each period were identified and analyzed. The operationalization of capabilities is adopted from Amit and Schumaker (1993) and McGrath et al (1995) who defines capabilities as the firm's capacity to deploy resources for desired end results and the individual resources as the stock of available factors that are owned or controlled by the firm. Constructs representing the capability process were developed building upon the extended case methodology (Burawoy 1998). The empirical data is interpreted with an aims to integrate the generated constructs with existing theory and concepts, rather than generating new theory. Constructs were derived within an iterative process based upon colour coding of the thick case descriptions and rewriting and grouping notes according to conceptual clusters. The resulting case firm descriptions were analysed with an emphasis upon the relationship between capability formation and firm growth. The resulting thick case firm descriptions were finally analysed in a cross case comparisons and pattern matching manner in order to find common patterns and paths of capability development with respect to further growth within the studied case firms.

**Analysis and synthesis of the empirical study**

This section analyses the capability building process within the studied eight firms. The empirical material is presented in four sections, to characterise the development during the growth of these ventures. Firstly the eight firms are described around the time of their initial foundation (sections I and II). Secondly, the analysis of the capability development process which occurred during the growth, are based upon the additional development of salient resources (section III) and the different organizational changes which occurred during growth in order to deploy and redeploy the accumulated salient resources (section IV). To analyse the capability formation of the growth of the firms, this study thus builds upon the differentiation of two states, the firm around the time of the initial foundation and the firm after growth had taken place. This is done to both identify what has changed and the processes which occurred internally during firm growth. Together, this gives insights within the processes occurring within growing firms in which organizational capabilities are formed out of independent resources.

[7] These resources thus form the building stones of the emergent capabilities as well as create the direction and path dependency for the further development.

*Initial founding (I)*

In order to understand the capability development process the initial resources endowments and opportunities acted upon was firstly identified within the eight different ventures. The inherited resources were identified in order to separate the inherited resource endowments from the ongoing addition of new resources and the development capabilities. The initial resources and activities of each firm at the time of foundation are here emphasised and exemplified by quotes from the original entrepreneurs obtained during the interviews.

Company A was founded by three entrepreneurs to commercialize a new promising technology developed at a local university. Through direct access to initial financial resources the ownership of IP were successfully acquired and the actual organization of the venture started.

*…The union of us three…We put a business plan together elected to fund the business through a private placement and took this up as a public unlisted fundraising process… The opportunity was that we could get our hand on the molecule in the first place… this is the base on the whole business…*

Company B was founded by a single entrepreneur to commercialize a new promising technology developed at a distant university. After a slow and painstaking effort to raise capital the initial entrepreneur had accumulated enough financial resources to take over the IP and found the firm.

*…It started with the project that I had to make it into a company...Just proprietary rights only! That was sufficient for getting the firm started...*

Company C was founded by two senior researchers out of a research institute. To continue to develop their commercially promising technology they set up a business venture. Initially consultancy services were sold, both to the research institute and to additional commercial partners.

*…We founded the company basically the two of us. Initially we developed a business plan to the company, did some consulting, essentially bootstrapped up to first product development just through consulting…*

Company D was founded out of inventive activities occurring at a private firm. As this firm refused to continue to develop and commercialize the promising technology in-house, four entrepreneurs left and set up a business on their own, while maintaining close links with their previous employers. These became their first customer.

*…It was based out of a technology that was developed within the private laboratories; they decided to spin out and make a company and start to sell these products. And they sort of all came together and decided to form it into a company and start to sell and develop further products from there… I had a prototype already working when I was taken over…*

Company E was founded by a university based research group which after losing a nation wide application turned to selling consultancy services towards a private firm in order to keep the group together. Surviving from doing research contracts the group continued to internally develop a promising technology.

*…The company was founded on the back of a substantial critical mass of scientist that was collected up at the university. We started bring in the funding to keep this group of scientist together…*

Company F was founded by a rather large research group around several promising technologies coming out of activities established at a local research institute. The institute had already established several activities in which contract and services were sold to the research community, but now completely separated themselves from the university environment.

*…We came out of an effort at the university, which happened to be devoted to this… Basically they had recruited and assembled a group of top names to develop something, a centre of excellence to work and develop this. We took over a lot of things from the research institute… The idea to turn this into a firm is then that the researchers more or less already were doing stuff for money, which had customers and a range of products. In the beginning we were quite big actually, we started big, and we took over a lot of activities from the academics… Basically we took over the whole applied group, and all their developed manufacturing capacities, and their existing portfolio of products …*

Company G was founded after losing a public research application when the group of senior scientists turned towards private investors. The firm was set up and financed to develop some of their promising technologies which were deemed to have huge commercial potential.

*…The only thing that actually was there to start from was the structure of the firm in terms of a shell a name and owners…*

Company H was founded by an investor who opportunistically acquired a bankrupt pharmaceutical facility. After recruiting several academics the venture rapidly established itself selling contract services, both towards public and private actors.

*…The first is a piece of infrastructure at a very good price, we started, we said we are going to be creative and be a contract manufacturer. So we were roughly the same size for a long time, the size needed to run it, we might have been around 20 people…*

These studied eight firms all started to grow and develop capabilities from rather different starting positions, in terms of resource endowments and in terms of different initial organizational size. This was so even though they are sampled out of a specific industry, such as all being bioscience based. Within seven out of the eight studied firms, the initial opportunities were perceived to emerge out from the commercial development of an innovative technology. Within the remaining firm, H, the initial opportunity was instead directly seen as an ability to serve the emerging market with services in technology development previously undertaken at a local university. Further on, the initial activities within all firms were centred on the initial development of viable business model around their promising technologies. As such they were all initially characterised by a profound initial dependency upon the inherited resource endowments. In four of these firms, the critical resources were the initial control of the associated property rights. As such the original business idea required extensive funding in order to generate potential future returns. These starting configurations might be a result out of the specific industrial context, as being bioscience based firms, as these often and indeed in these studied firms has a strong relationship to activities previously undertaken at universities and research institutions. The mechanism of technology transfer, as being transfer of IP or the spinning out of skilled individuals, thus effects the initial entrepreneurial development and potential for immediate further growth. Furthermore, these firms can at the start be divided up in two different groups. The first group consisted of firms which at the onset were based around the ownership of technology (IP) and additional initial financial endowments, but relatively lacking in skilled individuals and abilities to actually continue the technological development. The second group was based upon technological abilities of a larger group of entrepreneurs and individual scientists/technologist, but as such no inherent financial resources. This second group therefore initially focused upon generating immediate revenues. In addition, technology development being extremely costly within this industry emphasise the difference between the constituting salient resources as being centred on either financial and property rights or abilities for activities.

*Initial founding (II)*

To investigate the development of organizational capabilities, additional aspects around the initial activities and characteristics of the initially salient resource endowments at the time of their foundation are analysed. The analysis is based upon the thick descriptions of the initial activities within these eight case studies. Out of the analysis four constructs were generated describing the salient resources and initial activities within the initial developing firms. These were found to be captured within four constructs; Individuals, Assembly of indepent resources, Flexibility and Tentative business models.

Individuals

Within the initial firms development the firm was almost inseparable from the individuals involved. This implied that the human and social capital of the initial entrepreneurs' confluence with the resources of the emerging venture. As being primarily focused around the commercial development of new technologies, the skills and knowledge of individual entrepreneurs were hence frequently seen as critical at the foundation of these firms. These technologies were often based upon university research, and as such carried out of rather independent researchers. Alternatively were the ventures formed around the entrepreneurial discovery, by a limited number of individuals striving to take advantages of the initially perceived opportunity. This can be illustrated by the following 'representative' quotes.

*… You have a few individuals. These who know everything then becomes the centre of everything…*

*…We started very lean with a very much focused team…*

Assembly of the independent resources

A second characteristic of the initial emergence of the growing firms was the recruitment of additional independent resources stated as 'assembled'. As such these resources are distinct from notions such as 'developed' or 'learnt'. Thus, the assembly of resources entails acquiring resources that were previously outside the control of the company. The means of assembly include buying, borrowing, bartering or persuasion. This included the recruitment of 'star scientists' and access to additional services. Further on, these resources were frequently stated as accessed through buying, renting or otherwise acquiring access to and services from these necessary resources. A third aspect of 'assembly' was the gathering of necessary knowledge as being drawn from public science, such as by going through public information. Finally assembly was primarily also directed towards the initial resource endowments, but also upon the relationships which the individuals contributed with. All of the studied firms thus emphasised the assembly of additional resources, rather then the initial internal development thereof. This emphasis upon assembly of critical recourses, external to the firms partially relate to their industrial context. As being active within the bioscience industry, these firms emphasised immediate access to state of the art research equipment, knowledge about special practices and procedures relating to institutional regulations such as patenting and certified production standards.

*…'it was just picking the right bits and pieces together, to make it happen…*

*…we bought, paid to use their equipment…*

*…We assembled much of the skills, we bought them…*

*...You pick the individuals, that what companies like us do. We know what to do, and recruit the right people…*

*…you know there are books written on this, we just put it all together…*

*…staffed by people who stay with the academia, that is, they have a low risk and their job is not going to go away and they are going to do something else after that's done…*

Tentative business models

During the initial period a central activity of the emergent firms was to develop a viable business model out of the available inherited skills and resources. Both the specific technologically developments as well as the commercial viability were perceived as highly uncertain. Due to this rather large uncertainty and ongoing reorientations, several of the firms were reluctant to internally pick out and further develop and invest in too specific activities and resources. As such, these firms can be characterised as keeping several different options open as far as possible. This could be seen as these firms initially were involved within a continued search, in which the initial resources could be put to valuable applications. Nevertheless, these firms gradually gained an emerging focus around specific business ideas which were deemed viable to commit to and develop further.

*...we couldn't get any financing, that was due to the bad times in general, but also that our business ideas and business models were quite unrealistic...*

*…you have to restrict before you expand. Once that is established and consolidated you build on that…*

*… We can't take them all along, we basically constantly evaluated projects and opportunities and decided what to focus upon and we focus very much…*

*…So what happens is that you keep a number of low intensity projects going. Until you really believe in something. Then you go for it…*

*…Initially we are looking at broader scope but …*

*…Back in those days we produced a little bit of everything…*

*…there is opportunities to speed tings up, that's were you have to make the judgement, as to how strong do you believe in a project…*

Flexibility

By being constituted of only a few individuals, their resource endowments and initially assembled external resources were rather independent, the firms strived to maintain a potential to rapidly change their business goals. In addition, during the initial development, several of the firms were extensively studying alternative modes of commercialization strategies, such as selling ownership of technology to other parties rather than to actively continue the development with the formation of an independent firm.

*…we were small enough to make decisions quickly … to follow alternative paths and have options…*

*…and we outsourced a lot of stuff, by outsourcing all that, infrastructure, we could do things under contract. If we would have tried to do them internally it would have taken ages to set up and find the right number of people to actually do it…*

*.. We just evolved from one thing to the next. Then you can't really delegate at least we haven't done that, you can't build up systems.*

*…you want to be small flexible and an organization that can dissolve itself, because if you licence your technology I make it…*

*…It's moving targets! Where you and I wants to take this company changes by the day. So it's very unlikely that the initial target becomes the actual end goal, you constantly adjust and very often this is the case in my experience. Where you set out to go, is absolutely not where you end up…*

*...We did have this diversity in the beginning. That was not good it caused a lot of trouble. We spend a lot of time on non-business issues…*

The four constructs describing the initial unfolding of these eight bioscience firms thus focus upon the description of the initial state of emerging firms. These four constructs were termed 'Individuals', 'Assembly and independent', 'Tentative business models' and 'Flexibility'. The emphasis upon the search for a viable business model involved frequent changes which in turn required initial flexibility within the evolving venture. A particular mechanism to solve the need for flexibility was the strategy of being reliant upon individuals, and external but independent resources, assembled and temporarily accessed. On the other hand, the ventures was not completely flexible but were limited by the perception of viable business models emerging around the initial entrepreneurial individuals and their starting endowments. Seen from the perspectives on growth of entrepreneurial ventures the firm's initial resource base is virtually identical to the firm's founders (Hite and Hesterly 2001, Berglund 2006). Stated differently - 'Ventures that are unable to transition from reliance on individual resources … and extend those to organizational resources will be constrained in growth' (Brush et al 2001). Similar to a model of capability development by Helfat and Peteraf (2003) the founding state in which capabilities initially appear hence involved two general requirements, the emergence of a group of individuals and resources capable for performing activities and the emergence of a central focal objective activity, here stated as the process leading up to the development of an perceived viable business model[8].

*Emergence of organizational capabilities (III)*

This section presents the analysis of the unfolding of additional resources and activities during the growth of these studied firms. The specific development sequences were firstly derived from secondary data and thereafter revised through interviews. The focus is here put upon the addition of resources which were at least semi-permanently tied to the firm and which were deemed as salient for the subsequent activities performed by the firm. These salient resources are thus distinct from the resources which were deemed needed and necessary, but which these firms at that time correspondingly perceived to 'lack'. The analysis of the empirical material provided the specific sequence in which additional, acquired and developed resources were emphasised by the interviewed entrepreneurs / managers and deemed critical for the further development of each firm. The resulting order in which additional emphasised resources were acquired and developed showed differences (tab 1).

| **Firm** | **Order of initial and additional critical resources emphasised** | | | | | |
|---|---|---|---|---|---|---|
| | **Humans** (Number of founders) | **Financial** (Capital) | **Technological** (such as IP or skills) | **Relational** (Such as to Customer, Co-developers, Supplier) | **Organizational** (Internal systems) | **Physical** (Substancial assets) |
| **A** | **1** (3) | **1,2** | **1** (IP) | **3** | **4** | **-** |
| **B** | **1** (1) | **1,2** | **1** (IP) | **3** | **4** | **-** |
| **C** | **1** (2) | **4** | **1** | **2** | **3** | **5** |
| **D** | **1** (4) | **5** | **1** | **1,2** | **3** | **4** |
| **E** | **1** (6) | **3** | **1** | **1** | **1** | **2** |
| **F** | **1** (3) | **4** | **1** (IP) | **2** | **1** | **1** |
| **G** | **2** (6+2) | **1** | **1** (IP) | **4** | **3** | **5** |
| **H** | **2** (1) | **1** | **4** | **3** | **2** | **1** |

**Tab 1**

The specific sequences of resource unfolding within the eight firms were highly different. Three firms A, B and G who already at the onset had relationships within the financial community started selling equity, in order to obtain additional financing for their future technology development. These three firms were thus initially dependent upon their initial

[8] Within capability developmental models derived by Helfat and Peteraf (2003) as well as Siggelkow 2002 the development of capabilities involved an additional stages, which involves the maturity associated with the (re)-deployment and further opportunities rising out of the generated capability. For Siggelkow (2000) this is stated as thickening, reinforcing, patching, coasting while Helfat and Peteraf (2003) stat this as renewal, redeployment, recombination, replication, retrenchment, retirement.

access to additional financial resources in combination with their intellectual property rights. Sub-sequentially these firms relied upon the established external relations in order to continue their technology development mostly through the establishment of external relationships. A and B, were both initially reluctant to grow by the development of any extensive internal resources. The initial abilities were thus strictly limited to act as a financier and supporter of technological development. The additional abilities, beyond the specific financial aspects emerged rather late within the development process. Finally, these two firms have not yet put any real emphasis is on physical assets. For G, the resource development logic was the reversed, after a relative early focus upon builing up internal organizational resources through the internal 'training' of additional scientists; the emphasis was increasingly put upon advantages stemming out from external relationships and the developed physical assets.

Five of these firms; C, D, E, F and H, started by selling additional services and products rather than seeking additional sources of capital in order to generate additional financial resources for the development of proprietary technology. For firm H the initial emphasis was put upon the financial resources, the initial acquired physical assets and upon inherited organizational resources taken over from both university and the previous business which in turn made a business model around the sale of services potential. First at a later stage, additional external relations provided to be critical for the further development and the development of proprietary technologies. Firms C and D initially focused upon their external relations, providing both additional knowledge and cash. This gradually shifted towards an increased focus upon the development of an internal organization. Only in the later stages the focus of C and D was turned towards financial resources as well as upon their internally developed physical assets. The two firms E and F were both immediately being rather large organizations, with more than 10 employees. Both these two firms did emerge and were established under the direct auspices of parental organizations, a university and a research institute. These two firms were thus founded with an already established broad set of different but interdependent resources and could emerge as firms which accentuated both the inherited internal as well as external relationships and their physical assets. Further on, these two firms, which already at the onset were based around revenue generating activities, the importance of financial resources emerged rather late.

The development pathways in these analysed firms thus differed in which these firms were reliant upon different salient resources for their further growth. However, a common theme involved the gradually increased significant put upon the specific evolved organization around the performed activities. The sequence thus describes the transformation from ventures defined by high dependency upon individual resources, such as ownership of intellectual properties, and specific external relations towards a dependency on the gradually developed firm specific knowledge, internal organizational systems and specialized assets. This gradual development of firm specific capabilities for undertaking activities internally can in turn be associated by the ongoing growth which occurred within these studied firms.

*Organizational development (IV)*

The final step in our analysis of capability development during growth focuses upon the resource development processes and organizational changes which occurred. This analysis deals with the evolution and accumulation of salient resources and the associated emergence and development of capabilities within these firms. Analytically these aspects were derived by breakdown of the generated thick case descriptions through the creation of constructs capturing the different processes which occurred. The constructs were within two broad themes. The first group of constructs was centralized around the individuals performing activities within the firms such as ‘increased specialization’, ‘knowledge development’ and ‘interdependencies’. A second stream of constructs was related to the organizational context, that facilitates the activities in terms of ‘standardization’, ‘professions’ and ‘specialized assets’. The result hence describes capability development during firm growth as a process of transformation from being firms initially reliant upon independent individuals and the contributions from inherited resources into the advantages coming out of both activities performed of individuals within the emerging firm such as newly developed knowledge, learning and integration of additional employees, the emergence of interdependent activities, but also the development of strictly organisational assets and systems independent from the contributing individuals. As such these firms gradually build up the ability to undertake specific activities internally, forming the capabilities of the firm which are distinct from the contribution of the initially independent and atomistic resources.

<u>Specialization</u>

As the firms developed, the progressions of activities both generated and increasingly were dependent upon firm specific knowledge. As such activities were increasingly performed internally due to an internal commitment and necessity to develop increasingly firm specific knowledge relating to the specific project and products. In addition this was seen to give increased control over the activities, in terms of quality as well as the potentials seen in additional advantage within the emergence of internalized specialized knowledge production such as generating additional opportunities. As these firms did grow, an internal division of labour also increased the potential for further internal specialization and knowledge development.

*…in terms of actual impact you will get very little. This is the reason that you need to expand gradually your internal organization…*

*…the outsourcing model doesn't really work. You don't have people who are committed to you business. Right you have those solving problems for you but you get none of that spin off effects…*

*…this is a delegation process, they need to be internal, we need to get through this delegation process in which we lose control and we delegate more gets greater specialized skills into the group, so the quality of the, the risk is removed, and the quality of the firm increases. This process is going on all the time…*

*… it sorts of settles into relatively obvious areas of responsibilities…*

*…We have become a firm that actually works. We split the activities among us…*

<u>Knowledge development</u>

The increased focus upon internal knowledge was also the result of internal learning processes continually occurring within the firm during the course of activity. Even if these firms were initially formed out of highly skilled individuals, such as typically having PhDs, the activities performed were characterised by a slow process of individual learning and adjustments within the specific context of the firm.

*… People have worked their way up as they gained experience and made us expand!...*

*…So we had to learn that one. From consultant, from hiring people…*

*…It basically takes 1.5 years before you know enough to manage your own activities…*

*…each time it has led to particular challenges, which then had to be met and solved. And pretty clearly if they hadn't been meet the company would have failed and so you have to met those challenges and in by doing so you challenge the way the company operates, and certainty the way forward…*

*…We have the infrastructure in place we got experienced people with…*

*…We had developed a platform and needed to get serious...we had developed skills by mainly apprenticeship…*

*…Each time we move up the scale the level of expertise and experience, knowledge understanding as well as regulatory compliances improves…*

*…people who had been working in areas elevated to managerial roles as new staff came in under them, they were more like coaches, or supervisors…*

Interdependency

A third major theme within the emerging firms was the increasingly internal interdependencies among the accumulated resources in order to perform the desired activities. As such different individuals and resources were gradually becoming mutually dependent upon each other for the further effective development activities undertaken.

*… and you won't get all of these skills in one person, so you need those sorts of people individually, to make the project work. And that's why we need this critical mass. It is in project it can be, to get it going the whole time, a number of different individuals….*

*…even if you are a great guy on this technology you need to be complemented with others to understand if this is the right thing to do. Without a balance of different skills you are left there alone to just do it if you can. You easily forget all these other things such as the market, production and competitors…*

*…Different skills, and if you don't succeed in bringing them all together you won't get there.*

*…we build a team basically; we needed a group of different people. To being able to do this stuff…*

*… If you have just one marketing person here, he's going to feel a bit lonely, if it's all about just scientist in a place you just can't relate to anyone. They generate ideas and bounce ideas of each other and if they got a particular problem in which they got no personal experience they can just go to the next office and say have you had any experience with this…*

*Standardization*

A fourth category emerged as these firms increasingly became more standardized around certain activities. As such, specialized systems were increasingly put in place in order facilitate and support the ongoing activities.

*…You don't necessarily have control, but you have information of how they are going…*

*…As it gets bigger and bigger the less you can sort of rely on what's in your head…*

*…if some walks out, employs, someone of our employees they can learn something but in reality it's a complex system which is very difficult to walk around, with all, in you mind…*

*…in all areas we, we need to facilitate data retain systems. We got to have quality systems, we got to have regulative compliances, and we got to have an audit system and a control system…*

*…there were no systems in place of keeping track of were we were and we didn't know anything, where we were…*

*…We do develop, make them and sell them, as part of a routine, actually selling…*

*…And anyone can do it … But again regulatory compliances come in and that's pushing its out of the labs because they haven't the quality systems in place…*

Professionals

A fifth theme emerged as the firms increasingly emphasised a need for new professionals. This was part of the process of standardization and development of organizational systems, rather than upon the development of firm specific knowledge. The standardization involved an increasing potential to recruit additional employees without prior knowledge within the specific nature of the different technologies but with emphasise upon developing specialized supporting structures. In line with these processes seven of the original entrepreneurs left the firm, and handed over the general practices to recruited professional managers with extensive experience from the industry.

*…We gained credibility in the industry and in our own business, and each time, we increased ties with bigger and better people into the group. These guys that normally wouldn't be interested to go into a company at an early stage and that was due to the fact that we gained good data we moved the company forward..*

*…we brought in later on expertise in finance manager a CFO and also brought in some of that management…*

*…They were recruited into the, more into, for a specific purpose…*

*…And it sorts of as it grow it becomes too much for one person to, so you split the roles into two, more traditional individual looking after those…*

*…and now we have a functional management, for the processes and the systems…*

*…someone with the right qualifications should be able to walk into a role and pick up the manual and go from that, that's what it's about…*

*..But sooner or later you need to find a CEO who is more competent…*

*...After a couple of years in that role even I realized that it was very suboptimal. It takes too much time, takes to much brute force from me as a researcher to deal with those issues…*

Development of firm specific assets

Finally as a consequence of the performed activities additional resources were developed which were in close interdependence with the developing firm emerged. This includes several intangible as well as tangible resources such as the development of reputation, patent portfolios, customer bases and informational databases stored and controlled within the firm.

*…working pretty hard on developing our brand so that we begun to get an identity pretty quickly as you know the group that had the smarts within this emerging technology space…*

*…we were trying to build an IP position, I think its worth a billion bucks to get it right so you are not infringing on any patent. So there is a big fight going on over the area of IP. To be free of that, have you own IP that's the potential to licence…*

*…What we did was to spend a lot of effort on building a brand…*

*…we weren't capturing market shares we were actually building a brand new market. And that does require some degree of investments, so that's why it taken longer than we actually predicted…*

Section IV finally turned to the common processes within these all eight cases as a method to capture development of capabilities. The firms studied here have all undergone such common processes in which resulted within the formation of capabilities out of independent resources. During the evolution of these venture the initial resources, often rather instrumental and independent, are gradually transformed and integrated into complex and utilitarian resources bundles forming firm specific organizational capabilities. The processes occurring during growth were described within two broad themes, a group of constructs centralized around the individuals performing activities and a second stream of constructs related the organizational context. These firms were increasingly associated by continued technological development within these firms, but with an increasing emphasis upon the emergent capabilities rather than benefit from inherited independent resources. This finding is well in line with results which stresses the increasingly importance of intangible rather than tangible resources. The findings here are also similar to Brush et al (2001) who investigated how capabilities are formed *de novo* during the initial growth of new firms. Accordingly the development of knowledge-based, social and complex resources, making up organizational capabilities of the firm, are more important than individual and separate resources such as money and tangible assets during the development of firms.

**Conclusion**

This research was undertaken to understand the capability formation within growing bioscience firms. The specific aim has been to describe and analyse what happens in terms of capability development as the biotechnology firms grow, in order to better understand the growth process of new firms. The findings can be concluded and summarised within a number of points.

The first point is that growing firms within the bioscience industry are started with different resource endowments. These firms start to grow from different initial starting positions, with differences in their initial endowments. The general development involved the initial mobilizing of additional resources, combining and developing around a focal activity, often stated as the development of a viable business model. During the development process additional independent resources are access in order to develop the focal activities, such as the development of a lead technological project.

The second point made here is therefore that these firms initially are characterised by rather atomistic resources. As these firms continue to develop, they increasingly integrate and internalize additional resources. Even those firms who initially started as completely virtual firms has put together additional individuals and resources internally, and thus grown. Differences in their initial resource endowments as well as differences in the specific order which such additional resources were integrated into the firm resulted in different paths in the growth and the development of these firms.

Our third point is thus that growing firms within the bioscience industry evolves through different pathways in which salient resources are accumulated and result in further activities within these growing firms. According to our final empirical findings, these acquired resources, initially mobilized for the immediate short term usage, evolves into organizational capabilities. These rather independent resources are being transformed into organizational capabilities by knowledge development and evolved interdependencies through rather similar processes common to all of the firms. These processes, resulting within capability formation occurring during growth, were described within two broad themes, a group centralized around the development of individuals performing activities within the firm and a second group related the development of an organizational context providing a structural backbone for the focal activities.

Given our empirical findings the growth of new firms can both be understood and described as a gradual development and organizing of internal resources, forming capabilities within the firm. We do therefore fully agree with the call to synthesise entrepreneurship research and capability based theories in order to further understand the growth of new firms made by for example Brush et al (2001) and Alvarez and Buzenitz (2001). According to our findings the development of capabilities is the, often unintended, result of activities undertaken by these firms. The formation of capabilities is thus inherent in the organization of different resources within the firm. This is well in line with the capability or knowledge based theory of the firm as described by Grant (1996), Spender (1996) and Connor and Prahalad (1996).

We do also agree with the findings of Brush et al (2001) that, at least partially, the entrepreneurial challenge lies within the processes of creating an organizational resources base out of the initial entrepreneurial ideas. Given that in the capability based view of the firm, the competitive organizational advantages stem from the organization of resources, managerial and entrepreneurial limitations for growth of new firms found within failure to perceive external opportunities and resource mobilization, should also be complemented with the difficulties in developing the organization and taking advantages of the developed capabilities. Once the firm has managed to develop organizational capabilities, the organization of firm itself hence turns into an asset further propelling the subsequent growth. Further research upon these initial processes of organizational formation and capability building can complement the emphasis put upon opportunity discovery found within current entrepreneurship research. A better understanding around the capability building processes rather than opportunity discovery can also be fruitful especially as the success of entrepreneurship frequently is stated as the foundation of viable and growing firms.

Given the critique against stage based models given by such as Bidhé (2000) the processes occurring within growing firms should not be seen as a unifying development of which all firms go through. Neither should the growth of the small firm be seen as a process in which the development of the firm follows the different schematic stages in product development[9] This is also seen within our research where firms start with different resource endowments as well as recruit additional resources within different order. Nevertheless, these growing firms are united by their common processes of organizational formation described by the two broad themes. The first theme centralized around the processes leading to internal development and accumulation of firm specific knowledge and an increasing specialization of individuals and resources. The second theme relate to processes around the development of an organizational context providing a backbone for the focal activities.

Our study of capability development within small emerging organizations provides a better link to the micro foundations around forming organization out of separate resources and individuals. Stressing these micro-foundations, such as the integration of individuals and accumulation of salient resources into an organizational coherence, do avoid the tautological reasoning often found within capability based strategy research (Priem and Butler 2001a,

[9] This is true even for these firms within bioscience industry which has a product development cycles which is schematically well established into such stages as preclinical research, phase I, II and III.

2001b). Studies of capability development within growing small firms can thus complement the studies of capabilities within larger organizations. Previous studies upon capability development, such as by Danneel (2002, 2005), Siggelkow (2001, 2002) often takes the initial organization as given. This is also true for the abundant literature around organizational learning which emphasise the ongoing change within existing organizations. The processes of capability development are potentially more detectable within growing small organizations.

A first limitation has been to disregard firm growth, expansion, as the result of initial or external contingencies. As such the focal point has been to study the endogenous processes occurring within firms during growth, expansion, and the associated development within bioscience firms. Despite the highly idiosyncratic nature of venture development the goal has been upon the identification of common and general processes occurring during the growth of these ventures. The aim has been to analyse growth through the initial formation of capabilities for activities coming out of the organization of resources within the firm. A second limitation has been to disregard the continuity of development and growths occurring after capabilities have been developed. The processes in which the developed capabilities of these firms has been re-deployed in later stages of the life cycle of these firms, eventually leading to further growth, continuity or dissolved has been altogether ignored. This aspect of the developed capabilities and their relationship with further development and growth has instead been described within Brink and Holmén (2007). Accordingly, these initially evolved capabilities, as being developed within science based firms, provide few additional opportunities for future development within the longer perspective.

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