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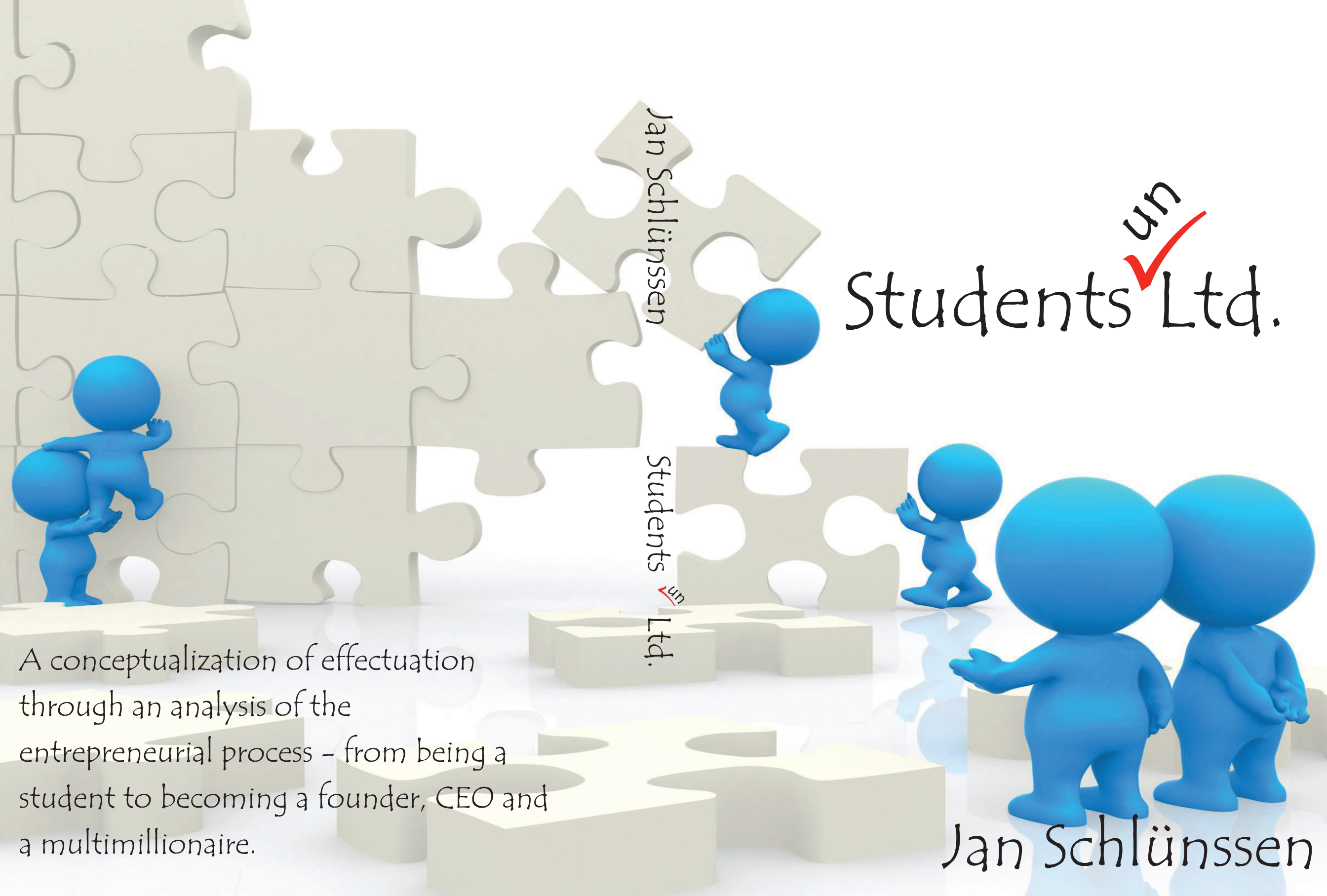
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Jan Schlünssen

Students Ltd.

Students Ltd. ✓

A conceptualization of effectuation through an analysis of the entrepreneurial process - from being a student to becoming a founder, CEO and a multimillionaire.

Jan Schlünssen

Title: Students **un**Ltd.

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Student: Jan Schlünssen

Supervisor: Professor Lars Bo Henriksen

”This thesis has been submitted for assessment in partial fulfillment of the PhD degree. The thesis is based on the submitted or published scientific papers which are listed above. Parts of the papers are used directly or indirectly in the extended summary of the thesis. As part of the assessment, co-author statements have been made available to the assessment committee and are also available at the Faculty. The thesis is not in its present form acceptable for open publication but only in limited and closed circulation as copyright may not be ensured.”.

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Preface

While working on and writing my dissertation, the preface seemed such an easy job. You thank people for helping you, and you thank the reader for spending time on your work. You want it to be interesting and hope not to forget anyone.

I would like to thank everyone around me, for having endured long lectures on the subjects of this work. Thank you for your ability to look interested and supportive all along, you have been invaluable. You have all stepped up to the plate when I needed you, to talk to or, as my friend Bent, doing all the graphic work on this research.

My old alma mater – Aalborg University for giving me this fantastic opportunity. I have been a student there in every decade this fine university has existed. I did my bachelor there in the 70s, my master in the 80s, came back to study history in the 90s, started my Ph.D. in the 00s and finished it in the 10s. Thank you for this opportunity. Thanks to my supervisor for sticking it through and supporting me. Professor Lars Bo Henriksen has taught me a lot, not only in my role as a student, but also as an educator.

My old student who led me to my case and has helped me all along, the owners and the founding team, thank you for spending time on me, and letting me into your company.

This dissertation started while having a dialogue with my boss, at the end of which I remarked that someone should look into it and research it. My boss answered "Why don't you? If you want to I'll help get the financing in place". That little seed stuck with me, and grew; he supported me when I moved on to innovation and entrepreneurship, creating courses, and worked with me on my idea for a new Engineering education. Without his support and trust in me, I would never have dared to embark on this research. My deepest felt thanks go to the late Daniel Mottelson – in memoriam.

I have to thank my close friends for having endured me, and I especially have to thank my family for missed vacations, and for enduring my single-

mindfulness, and still be willing to help me whenever help was needed. For reading and commenting, for checking spelling and grammar, and for loving me all along.

To my son Poul and my wife Ewa

Næstved, March 2014

Jan Schlünssen

Abstract

The lack of natural resources has meant that the Danish society has always had to rely on innovation, and the ability to foster remarkable companies through entrepreneurship. A lot of research in a lot of different areas has been done to see how the society could further innovation and facilitate the development of these ventures. For the last decade or more, the official policy has been that everyone from kindergarten to Ph.D. ought to be exposed to entrepreneurship. Consequently, many programs have been put in place to reach that goal. This research constitutes an attempt to examine how successful student start-ups work and to see if this knowledge can be implemented in a Problem and Project Based Learning (PBL) setting.

The research question: How can an analysis of the process of successful knowledge-based start-up contribute to the conceptualization of effectuation, and what practical implications does it have for how students acquire experience and skills in innovation and entrepreneurship under PBL?

Method: A case study was chosen as a method for conceptualizing effectuation. The case concerns a student start-up based on a technological advance. Additionally, a second case is introduced since the founders are participants in a business plan competition hosted by Venture Cup, which has a sequential and causal approach to entrepreneurship. Its goal is to use the business plan to attract venture capital. The start-up does extremely well in this competition, which makes it possible to see if the causal approach adopted by the competition is useful in the process of creating the start-up. It is argued that it is a critical case. If the case uncovers that the success of the start-up is based on a strict business plan approach, then the business plan approach has proven its value. On the other hand, if the research shows that the founders did not follow the plan when setting up the start-up, the value of a business plan approach becomes questionable.

Theory: In order to understand the entrepreneurial and innovative process, relevant theory is presented as a foundation for analysing the cases.

Actor network theory describes the elements involved in the process of creating a successful start-up. Also, in order to understand this process, the theory of effectuation is introduced and its conceptualization is undertaken to broaden the scope from expert entrepreneurs to novices such as students.

Findings: The case supports the newest research about the team being the foundation of entrepreneurship, replacing the notion of a super-human with a special gene who creates new companies. Companies are created in a process involving more than just one founder, often by founders working in a close cooperation with a founding team who are as important as the founders themselves. Theoretically, innovation is a marker of entrepreneurship. Therefore, the term is introduced and discussed. Throughout the study, it is used to denote an iterative process with the entrepreneur as the pivotal point. When dealing with knowledge based start-ups, the importance of the technology as an actant is emphasized. The technology is not only the foundation of the start-up. For the founders and the founding team, it is also the motivation for getting involved. The results from the case study were implemented in designing a Sommerhøjskole, which is a course involving both students and companies. It is shown that a Problem- and Project-Based setting can be created where both students and companies work together on solving a real problem as described by Henriksen (Henriksen et al 2004) and in this create valuable innovation. Creating parity between the students, company representatives and faculty is found to be central to obtaining positive results. Effectuation as described by Sarasvathy (Sarasvathy 2008) is based on expert entrepreneurs. This study shows that even though the students took part in a business plan competition which represents a causal approach both in the process leading up to founding the company and those taken immediately after that, their strategy was effectuation, which proves the hypothesis put forward by Sarasvathy. The last step of this research involves comparison between the findings from the case and the principles of PBL at Aalborg University. When evaluating the principles, it is shown that PBL is able to accommodate innovation, whereas handling the curricula goals with projects based on real problems may prove challenging. Finally, a model for accommodating not only innovation but also entrepreneurship in educational settings is presented.

Resume på dansk

Manglen på naturressourcer har betydet, at det danske samfund altid har skullet leve af innovation og evnen til at skabe bemærkelsesværdige virksomheder gennem iværksætteri. Megen forskning i mange forskellige områder er blevet gjort for at se, hvordan samfundet kan fremme innovation og fremme udviklingen af nye virksomheder. I det sidste årti eller mere har den officielle politik været, at alle lige fra børnehaver til ph.d. skal introduceres til iværksætteri. Derfor er mange programmer blevet indført for at nå dette mål. Denne undersøgelse forsøger at klarlægge, hvordan opstarten af succesfulde studenter start-ups foregår, og finde ud af om denne viden kan implementeres i problem- og projektbaseret læring (PBL).

Forskningsspørgsmål: Hvordan kan en analyse af processen med en vellykket vidensbaseret opstartsvirksomhed bidrage til konceptualisering af ”effectuation”, og hvilke praktiske konsekvenser har det for, hvordan de studerende tilegner sig erfaring og færdigheder inden for innovation og iværksætteri under PBL?

Metode: Et casestudie blev valgt som en metode til at konceptualisere effectuation. Casen omhandler et studenter start-up baseret på et teknologisk fremskridt. Derudover er en anden case medtaget, da grundlæggerne er deltagere i en forretningsplankonkurrence arrangeret af Venture Cup, der har en sekventiel og kausal tilgang til iværksætteri. Venture Cups mål er at bruge forretningsplanen til at tiltrække venturekapital. Casevirksomheden klarer sig særdeles godt i denne konkurrence, hvilket gør det muligt at se, om konkurrencens kausale tilgang er nyttig i processen med at skabe den nye virksomhed. Casen anses som kritisk; hvis den afdækker, at virksomhedens succes er baseret på en causal tilgang som skyldes forretningsplanen, så har denne tilgang bevist sin værdi. På den anden side, hvis undersøgelsen viser, at grundlæggerne ikke fulgte planen, ved etableringen af deres start-up, er værdien af en forretningsplans tilgang tvivlsom.

Teori: For at forstå den entrepreneurielle og innovative proces er rele-

vant teori præsenteret som et fundament for at analysere casene. Aktør-netværks-teori beskriver de elementer, der indgår i processen med etableringen af en succesfuld ny virksomhed. Konceptualisering af "effectuation" tilstræber at udvide anvendelsesområdet fra ekspertiværksættere til novicer som studerende .

Resultater: Casen understøtter den nyeste forskning om at team er grundlaget for iværksætteri. Denne kan erstatter forestillingen om et super-menneske med et specielt gen, der opretter nye virksomheder. Virksomheder er skabt i en proces, der involverer mere end blot én grundlægger. Ofte sker det at stiftere arbejder i et tæt samarbejde med et stiftende team, hvis deltagelse er lige så vigtig som stifterne selv. Teoretisk set er innovation en markør for iværksætteri. Derfor bliver begrebet "innovation" introduceret og diskuteret. I denne afhandling, bliver det brugt til at betegne en iterativ proces med iværksætteren som omdrejningspunkt. Når vi beskæftiger os med vidensbaserede nystartede virksomheder, er betydningen af teknologi som en aktant afgørende. Dog er teknologien ikke kun fundamentet for opstart af virksomheden. For stifterne og teamet, er det også motivationen til at blive involveret.

Resultaterne fra casestudiet blev anvendt til at designe en Sommerhøjskole, et kursus der omfatter både studerende og virksomheder. Det påvises, at et problem - og projektorienteret læringsmiljø kan oprettes, hvor både studerende og virksomheder arbejder sammen om at løse et "real problem", som beskrevet af Henriksen (Henriksen et al 2004), og derigennem skabe værdifuld innovation. Paritet mellem de studerende, selskabets repræsentanter og undervisere vurderes at være centrale for at opnå positive resultater.

Effectuation som beskrevet af Sarasvathy (Sarasvathy 2008) er baseret på ekspertiværksættere. Denne afhandling viser, at selv om de studerende deltog i en forretningsplankonkurrence, som repræsenterer en kausal tilgang, er deres reelle strategi baseret på effektivering både i processen op til at grundlægge virksomheden og de beslutninger der tages umiddelbart efter, hvilket beviser Sarasvathy's hypotese.

Det sidste trin i denne afhandling udgøres af en sammenligning mellem resultaterne fra casen og principperne for PBL på Aalborg Universitet. Det vises ved vurderingen af PBL's principper at metoden er i stand til at rumme innovation, hvorimod arbejde med projekter baseret på "real problems" kan gøre det svært at sikre at de faglige mål bliver nået.

Til slut bliver en model med henblik på at indpasse ikke kun innovation, men også entreprenørskab i en undervisningssituation præsenteret.

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Problem analysis

My first insight into entrepreneurship was gained during the second semester of my master program. We were challenged by our supervisor, and his tool was an ad trying to get someone interested in buying a Lee Cooper production facility in Hjørring, Denmark. What the advertisement said was how many square meters there were and how many people could work at the facility, etc. Unemployment was 11% and rising, interest rates were 20% and rising, so the proposition to find someone who would buy a factory and hire the people in order to produce garment which a major player had not been able to make profitable, seemed hopeless. The challenge my group received was: see if you can find out what these people are capable of and see if there is a possibility to actually restart that company. Later, when we found that there was a niche, we were also asked to find the capital. That was the final stop for us in 1981. Three students could not borrow DKK 10 million to take over a company. We were set off on a sort of entrepreneurial endeavour, trying desperately to find a profitable market large enough and enough cash to service it. Thirty years later, the other two members of the group run their own companies, and I research entrepreneurship.

As a theoretical tool for understanding what was going on, we used the works of Kirzner (Kirzner 1978) and his use of unequilibrium as a vehicle for understanding what was going on when entrepreneurs were at large. You could say that “man begriber med sine begreber” (Hildebrandt 2005) or in my own translation “your conceptions are limited by your concepts”. Our understanding was that some people just became entrepreneurs – you could not stop them, they just were, they had the gene in them, they had the background for it. We looked at an entrepreneur as a person who is an entrepreneur, not as a person who becomes one. Looking at the group, we hardly accepted that one of the members was an entrepreneur although due to his father’s illness he was in the process of turning a seine and trawl

binding company into a sports net company. In fact, he was paying his way through university by running this company, but we did not see him as an entrepreneur. We understood his rationale for moving from one industry to another as the simplest of economic reasons. The question of how he did it was not worth a university semester project. But finding an un-equilibrium in the garment market was. Our concepts for understanding entrepreneurship were limiting our conception of what it was. We were educated in economics, so the concept of a market equilibrium or the opposite governed our conception of entrepreneurship. That was my first encounter with how a macro economist worked, and still works, with entrepreneurship, and how it was, and still is, conceptualized.

My master thesis was about an entrepreneur, again in the garment industry, but this time again not about how to create the company but how to optimize it. Subsequently, I went to the U.S. to work in the jewellery industry, which consisted of predominantly small family companies. Through research using trade magazines, I came across a lot of articles about starting your own company, and quite a few were about the cost of starting, the cost of running your household, etc. Those articles were far more about doing than analysing.

On my return back to Denmark, I went into a corporate career and it was only later that as a teacher, I came in contact with the subject once again.

A change of the Danish government at the beginning of the new millennium resulted in a new a government policy which stressed that:

“There is a close correlation between knowledge, growth and welfare. The creation of the new Ministry for Science, Technology and Development is therefore a clear signal that the government wants to make Denmark one of the leading countries within high tech.

The great ambition of the new ministry is to strengthen research in Denmark and to ensure that research results are put into production as soon as possible to generate earnings for the benefit of the entire Danish society. The government aims to create a strong and short chain from the moment a new idea is born till it is used by a company. Therefore, the government will also present an ambitious plan for more entrepreneurs in Denmark.

We must look at the tax system: it must be profitable to start new companies. We must remove the hassle and red tape so that entrepreneurship is not stifled under mountains of paper. There must be better conditions for making inventions, research and development in private enterprises. And all education must

strengthen a culture of independence, where they young people discover the desire to put things in motion.

We must renew society, so we have room for initiative, innovation and inventiveness. “¹

Over the next years a lot of initiatives were made to follow up on this policy statement. Money was made available for the creation of courses and initiatives within entrepreneurship and innovation e.g. Oeresund Entrepreneurship Academy. Idea House started 2005 to help students create their own company. Venture Cup started in 2000 as a competition for university students in which the participants can win 250.000 DKK. for the best business plan. Connect Denmark, which began in 2000, has the purpose to make entrepreneurs successful with their start-ups.

In this way, entrepreneurship and innovation were firmly placed on the agenda. And for the educational sector, the dogma was that everyone from kindergarten to PhD should be given the opportunity to take a course or a program in this field.

My own entrance into the field was somewhat different. As a teacher at an Engineering College in the department for further education, I taught students who were predominantly engineers. All of them had a full degree and a few years' practical experience behind them, and were enrolled to take a bachelors degree in Engineering Business Administration as a part-time study while holding a full time job. In one semester in 2004, I supervised three student theses about innovation. It turned out that they all took part in an initiative called Initiative for Creativity and Innovation (IKI in Danish), which is an organization funded by large corporations. The respective papers were based on the students' companies, each being a world leader in their field, known for creating lots of innovative products. I assumed that handling innovation processes from idea to final commercialization would be the key competence of these companies. To my surprise, they all had problems handling this process. It seemed to me that engineers were very capable of solving problems as soon as the project achieved lock down in a stage gate model. Getting from one stage to the next and dealing with “technical” problems were no problem either. The problems seemed to arise when maneuvering in the organization, which lead me to believe that the problem was grounded in a multidisciplinary setting. Pondering this problem and discussing it with my boss, I was encouraged to write it up and send it to the committee dealing with new courses and programs. For a long time I heard nothing, and had given up on the idea, when suddenly I

¹ Statsminister Anders Fogh Rasmussens redegørelse i Folketinget tirsdag den 4. december 2001 Primeminister Anders Fogh Rasmussens inaugural speech in Parliament Tuesday the 4th of December 2001 — my own translation

was called to meeting with another department, which was interested in the entrepreneurship- and innovation part. So the first result to come out of it was a very traditional Innovation and Entrepreneurship course.

However, the planning of this course meant that I had embarked on a learning process to understand what was meant when we use terms as entrepreneurship and innovation. The first problem is, of course, using English language literature. The terms seem to translate so easily, but the similarity is superficial. The word “entrepreneur” has a sibling in Danish. “*entreprenør*”. It sounds very much alike, but in Danish it might as well be an entrepreneur as a contractor, closely associated with heavy machinery such as bulldozers. This transition of meaning to a real entrepreneur has led to a lot of confusion. Entrepreneurship, spelled exactly that way, is used in Danish to define the start of a company. The Danish society at large, that is outside the research community, will use two terms “*iværksætter*” and “*selvstændig*” without making any distinction between them. Furthermore, the people involved use the terms with the same recklessness. An “*iværksætter*” is a person who starts a company. An “*entreprenør*”, in turn, is a person who starts a company based on a new idea (unless it is a person who owns a construction company, which until recently was the generally accepted meaning of the word). The meaning of “*selvstændig*” is closest to the English term self-employed.

So communicating ideas about entrepreneurship was not easy. Planning my course was based on what Kirketerp (Kirketerp & Korsgaard 2007) terms generation 1.0 entrepreneurship course, which is a course heavily based upon the creation of a business plan. But since there could not be a requirement that the student had a business idea on which to create a plan, innovation/invention came into play. This led to the first strengthening of my understanding of the term “entrepreneur”. In my search for appropriate literature for the course I came across Peter Drucker’s *Innovation and Entrepreneurship, Practice and Principles*. In this from 1985, he stresses the previously mentioned difference between self-employment and entrepreneurship.

Drucker’s view on innovation focused on areas which provided a possibility for innovation. He addressed different venues where innovation could be possible, or you may even say, different approaches to where innovation could be possible. But there is no discussion or mix-up with creativity. It can be a systematic approach leading to an opportunity or the unexpected or bright idea. This approach gave the students a system of addressing innovation. Without a doubt, the course involved creativity, but it was not its focus. The focus was to come up with an idea and then turn it into a business plan. Undoubtedly, a huge advantage of this was the fact that the course relied heavily on areas which had been taught previously, though not together, so creating a curriculum and examining it was easy.

This first course led into an full semester on innovation and entrepreneurship, and was very much in line with the *Zeitgeist*. Based on this, a long and until now tedious process of trying to fund a student incubator was initiated, with all the considerations and theoretical arguments which could be found. And in the process of writing the applications, the many approaches to how to “make” an entrepreneur became clearer. For instance, the Danish Idea House not only focused on the individuals who wanted to start a company but also introduced what they called co-pilots, i.e. students who wanted to try to get involved, but had no idea of what to start with. Looking abroad, Columbia University in New York, NY had a very close cooperation with entrepreneurs themselves and helped the students not only draw up a business plan, but also to put it into motion. This idea of combining educators with entrepreneurs seemed very natural and self-evident. In the process, I contacted quite a few of my old “students” who by now had their own companies to ask them two questions: “Why did you start?”, and “Will you agree to be a mentor in this project?” The answers to the first questions were many, ranging from “because I lost my job”, to the more exotic “because I got tired of driving to work”. The latter came from a very successful entrepreneur. The story was that he had been working for a privately owned company situated approximately 40 km outside of Copenhagen, which had all their projects in Copenhagen. So he started the day spending an hour driving to work to do all the administrative work, then had to leave for Copenhagen to check up on the progress of the staff working on projects in the city. Getting bored with driving to another town, to work for someone else who had exactly the same educational background, led to the decision to start his own company. Together with his wife, he emptied their bedroom, which became the first office, and cut down on all their costs so that they could live on his wife’s salary, and off he went. In a very few years, he employed 50 people and was nominated a Gazelle company.² He had never strayed from having self-financing as his prime target. Early on, they had bought a domicile, and within the first eight months paid off the mortgage. I got to know him when he had 40 employees and he decided that it was time to learn some theory about running a business. At that point of time, I had no idea that what he had practiced was nearly in line with the theory of effectuation, established by Saras Saraswathy (Saraswathy 2008), a theory I would come across while working on this study.

In my own department, we looked into starting a degree program in Intrapreneurship and Innovation. We thought that the potential for students,

² A gazelle is a company that over the past four consecutive years have had positive growth in revenue or gross profit and overall has more than doubled revenue or gross profit in the period.

most of whom have their courses paid for by their employer, would dwindle if we focused on entrepreneurship.

The last spin-off of my suggestion was a pitch at a college workshop for all employees, held twice a year at the place where I work. The pitch was about the necessity of doing something about the students' need to learn how to create new projects, define new business areas, and of course set up their own companies. This led to the formation of a small group of four people, who with absolutely no official mandate from the college kept working for two years on an idea of setting up a new engineering program. The focus was on process handling in regard to innovation and project management. The skunk-works would eventually lead to the formation of an official group with the mandate to create a new specialty.

The group initial desire was to educate an engineer who could function in chaos, make sense of it and keep the project going. The idea was to make an educational program that would promote an acceptance of other areas of expertise during the course of studies. This would be achieved by taking three specialities of engineering and letting them not only work together, but also work with students from other institutions. The purpose was to create engineers who could not only solve the problems within their expertise, but also be able to work both within the organization and outside of it to keep the project running. The engineer should not be a process consultant, but a building, mechanical or IT engineer in possession of, among other things, some of the skills of a process consultant. Add to that a knowledge of economy and business, together with the ability to innovate and handle creative processes. The outcome would be an engineer able to handle all kinds of diverse problems that could occur throughout his or her career. Devising a curriculum that would guarantee this outcome is a complex task in itself, not made any easier when you add the demand by the Danish Ministry of Education, specifying that every educational program has to have a board representing potential employers following its activities and voicing their needs. Nor should we forget the fact that in order to confer the title of an engineer, an educational program has to be approved by The Danish Society of Engineers (IDA). In the end, and following a lot of bumps on the way, the educational program was approved. It is now established and now have its first graduates.

The learning process resulting from devising a new educational program with cooperation of participants of different backgrounds and intentions was in itself rewarding, but it also created ample room for reflection on why certain things had to be taught, how they were sequenced and what pedagogical and didactic methods were used. It was evident for us that we could not have an educational program based solely on standard classroom lectures and training sessions. We were a Problem and Project Based Learning PBL

institution and we wanted to use this method more than we had previously. We had lengthy discussions about the multidisciplinary approach, and how to implement it given that our own students were all engineering students who represented the necessary diversity of backgrounds. For instance, what could we leave out of a construction engineer education in order to create room for other subjects we found necessary? Projects were to be a very important part of the program, but we had to define what they should involve and how we could plan them so that the potential entrepreneur and the potential employee would draw sufficient benefits from the process.

All these considerations stayed with me, leading to even more confusion, reflections and a desire to know more about how to make students entrepreneurial. I started wondering whether all these “add-on” approaches are actually the best way to go. I call them “add-on”, because often courses tend to stand alone without being an integrated part of an educational program. When companies ask employees to take courses, the knowledge which the employees acquire does not get grounded in the day-to-day work of the company. In a way, creating an engineering educational program with the purpose of infusing the students with entrepreneurial skills is a contradiction in terms. Entrepreneurial thinking will always be a problem for all remaining engineers who do not take that type of degree but would rather go for chemistry, life science, nanotechnology, space engineering etc. The problem is that by establishing new educational programs and offering new courses we do not solve the problem of making all the students entrepreneurial, innovative and creative. We just put a patch on the problem and leave it for the students to solve when they graduate and start up their careers as employees or entrepreneurs. If we really want to solve the problem we have to build these competencies in all aspects of our educational programs, not in special niches in the system. This is substantially easier said than done.

A lot of research has been done on entrepreneurship. The early studies concentrated on a macroeconomic level (Schumpeter 2008, Kirzner 1979) and then the focus seemed to change to a more national perspective: what

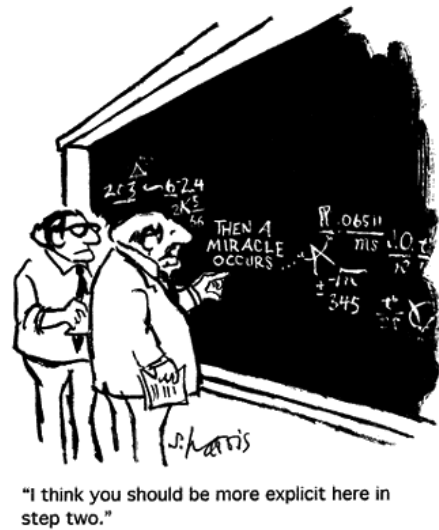


Figure 1.1: With permission from S.Harris inc.

could various countries do to make it easier for entrepreneurs to start up their companies? This approach was exemplified by the IKE project at Aalborg University (Lundvall & Johnson et al. 2002), and has remained in focus till now. Regarding the instruction, the focus was on the business plan. The next step was the introduction of the theory of effectuation by Saras Sarasvathy (Sarasvathy 2008). Her point was to research how successful serial entrepreneurs made decisions. Previously, business plan revolved around causal decisions, which made following the plan a relatively simple process. But successful entrepreneurs do not always make decisions like that. The lack of money or, over time, the accumulation of experience and expertise make them adopt an effectual approach based on four questions: “Who am I?” “Whom do I know?”, “What do I know?” and “How much can I afford to lose?” Based on this analysis they decide if and how to start a venture, and which focus it is going to have.

This approach does not have much in common with the present mode of teaching entrepreneurship to the students. We offer courses and competitions in innovation and entrepreneurship, such as Young Enterprise and Venture Cup. Both of these programs focus on making a business plan for implementing an invention. But the actual innovation, that is taking the invention to the market and in the process creating a company, seems to have been overlooked. Very little is known about what students do or when they decide that an invention is so good that they just have to start a company, no matter what. In the cartoon by S. Harris, much is apparently known about phase 1 (in my case macroeconomics), and phase 3 (in my case “the new start-up”), such as what they should do, and how they should plan the growth of the company. However, questions remain regarding the actual founding and start of the company. These are not just issues pertaining to legal technicalities, but first and foremost the analysis of the whole process which brings young people to risk it all. Peripherally, it might be interesting to look at start-ups gone wrong, if only to help students avoid starting such companies. All in all, in order to shed light on how people become successful entrepreneurs, we should consider successful knowledge-based start-ups and examine what they did since we cannot ascribe their success to genetic causes or miracles.

Problem statement

The research question is therefore:

How can an analysis of the process of successful knowledge-based start-up contribute to the conceptualization of effectuation, and what practical implications does it have for how students acquire experience and skills in innovation and entrepreneurship under PBL?

The foundation of effectuation is based on research of experienced entrepreneurs creating high value companies, not all of them being high tech companies. In this study, effectuation will be viewed as instrumental for the analysis of the process. However, it should be emphasized that there is a substantial difference between the approach of a student and novice entrepreneur and a seasoned and successful expert.

The entrepreneurial process examined in this paper will be depicted as a conglomerate of different theories that illuminate the path which an entrepreneurial endeavour constitutes. In order to understand and further this process among students, this paper will present a case study of a successful high-tech student-founded company. The reason for this is to find out how the creation of the company actually took place: how the students moved from the initial idea through the pre-firm phase to the actual founding of the company – and eventually to the successful high-growth company.

The case study is hence the narrative by which a conceptualization of effectuation used by students is reached. Since effectuation is somewhat contrasting the classic business plan approach, the case is a company which won the most prestigious student business plan competition – and in contrast to many other winners survived, and thrived. The case hence have the paradox of being the best of its “class” in regard to capabilities in writing a business plan – but also the best at creating and running the company – effectuating. This gives room for comparing the two approaches, and the implications each approach hold towards the other.

2. Problem statement

When a conceptualization of effectuation is reached, the understanding of the process of effectuation and hence the process of entrepreneurship is compared with PBL – as it is outlined by Aalborg university in the publication “Principles of Problem and Project Based Learning - The Aalborg PBL Model” The purpose is not to research the studies at Aalborg University and their compliance with the need for facilitating effectuation, but to see if the principles of PBL at Aalborg University can comply with, even support and enhance the students in acting in an effectuation process.

Method

The purpose of this research is to conceptualize effectuation in successful student start-ups. The research questions focus on what happens in and around an entrepreneur and an entrepreneurial team as well as what causes the entrepreneur to make the decision to found a company. The starting point is that the process involves a person or persons, a founding team, involved in the start and the development of the company.

Choosing a methodology for researching a process in a group naturally leads to the choice between a quantitative and a qualitative study. Unfortunately, we do not have any prior knowledge about the process other than the fact that it took place. The entrepreneur took the decision and executed it, which represents a very casual approach much in line with Henri Fayol's (Fayol, Coubrough et al. 1930) and F. W. Taylor's (Taylor 1911) strict problem-solving, planning and executing view on how to manage a process. If the process was certain, a qualitative approach could be chosen since the questions to be asked would be given. So if the currently prevailing business-plan approach was viewed as a tool to be followed, a qualitative study based on a questionnaire could be chosen. Provided all the respondents had used a business-plan approach, this would be accepted as the method of preference and the method to be used. However, it would limit the problem of starting a new venture to a simple analytical process, and a question of whether the project could yield enough profit or not.

There is a difference between teaching a theoretical, hypothetical and a real problem. This topic will be elaborated on when the findings of the case are transferred to a teaching situation in chapter 7.2. For now, we define real problems as ones "that call for proper analyses as we do not know what to do about them. There is no tool or theory that is able to frame the problem and we do not know what to do as we do not possess the language necessary to even talk about them. Before we can do that, we need to make a proper

problem analysis and a workable problem statement. In this way problems are part of a process, where the problem is constantly re-formulated or conceptualised.”(Henriksen 2011)

In this case, the theoretical problem becomes real the moment the two students decide so to say to strike out and form their own company. In that instant and shortly after that, especially when they hire two employees, the question of making a successful business plan turns into a question of or a necessity to build a successful business. How does the transition from theory to a real problem influence them? Does it influence both the founders and the founding team – and in what way? How do they perceive the effect of the cold reality of running a small company with limited funds? The above questions will be addressed later in this study. As for funding, ”The Company” solves the problem by getting into a close cooperation with a customer, who becomes their source of financing, and keeps the development of the technology on track due to the delivery deadlines.

The start may be to win a business plan competition. However, ”The Company’s” founders are also genuinely interested in the technology. Consequently, the engineer has so to say win the economist over. Now that the technology plays a role for the team, does it pose a challenge they want to take up? Or is it something they just want to play with? Is the technology an attraction in itself? In this way, the technology goes from being a mere technology to becoming as important in the process as the founders and the team.

While it is questionable if new high-tech ventures founded by students can come up with a business plan with a Return On Investment ROI high enough and certain enough to attract investors, obviously they do start. This study will focus on the elements that the process comprises. A similar approach was stressed in the paper *“Who is an entrepreneur?” Is the wrong question* (Gartner 1988). We cannot find entrepreneurs but we may develop our knowledge about what makes an entrepreneur.

This leads to the theory of actor network theory as a tool to handle the case. Here, the actors take upon themselves the task of being narrators for themselves as well as for the actants. So instead of being told in a chronological sequence, the case is presented by the actors and through their interaction with the actants in the case.

3.1 Case study

Why a case study, then? Yin (Yin 2008) defines a case study as

A case study is an empirical inquiry that

- Investigates a contemporary phenomenon in depth and within its real life context, especially when
- The boundaries between the phenomenon and context are not clearly evident

The phenomenon to be investigated is the creation of a successful high-tech company founded by students, which of course sets the study in a real life context. And since the purpose of the research is examining the process, the outcome should not be numerical data output nor a statistical significant confidence interval but an understanding. Looking at the company, we now know that it exists and that it is successful, but in order to understand the outcome we must understand the phenomenon and the context.

The difference between the two cannot be easily explained. Gartner quotes Yeats in his paper *“Who is an Entrepreneur?” Is a Wrong Question* (Gartner 1988), asking “How can we know the dancer from the dance?” (Yeats 1941 “Among School Children”), which is a very adequate description of the phenomenon, process, and the persons involved.

Flyvbjerg (Flyvbjerg 2006) says about case study that there are several ways to conduct a case study, and several misunderstandings. In this context especially the strategy for the selection of samples and cases is interesting.

The first distinction is between random selection and information-oriented selection. When choosing at random, you have to take into concern if your population is sufficiently large. Already at this stage, looking at the number of successful high-tech student start-ups, the numbers do not qualify. Firstly, the population has been defined as winners, 2nd and 3rd runner-ups in Venture Cup. The total population grows by only three per year and at the time of choice included only 30 potential candidates. Secondly, among this population a very limited number could be called successful.

With a limited pool of prospective cases, finding a strategy for selection and a methodology for this research leads to the information-oriented strategy.

To achieve variation you need several cases. In order to be part of this research, the potential cases must have started as knowledge-based or high-tech start-ups and have evolved to be successful companies. Looking at all the winners and runner-ups, it would be easier to argue that a successful start-up is an Extreme or a Deviant case in so far that a majority of the population either did not survive or start.

A critical case is a criterion that can be applied in reference to the general problem: “If this is (not) valid for this case, then it applies to all (no) cases.” So if the winner of Venture Cup has solidly used and followed the business plan for creating the successful venture, then the business plan approach is correct. If, on the other hand, the winner has reached success via another

3. Method

Strategies for the Selection of Samples and Cases	
Type of Selection	Purpose
A. Random selection	To avoid systematic biases in the sample. The sample's size is decisive for generalization
1. Random sample	To achieve a representative sample that allows for generalization for the entire population
2. Stratified sample	To generalize for specially selected subgroups within the population.
B. Information-Oriented selection	To maximize the utility of information from small samples and single cases. Cases are selected on the basis of expectations about their information content.
1. Extreme/deviant cases	To obtain information on unusual cases, which can be especially problematic or especially good in a more closely defined sense.
2. Maximum variation cases	To obtain information about the significance of various circumstances for case process and outcome (e.g., three to four cases that are very different on one dimension: size, form of organization, location, budget).
3. Critical cases	"If this is (not) valid for this case, then it applies to all (no) cases."
4. Paradigmatic cases	To develop a metaphor or establish a school for the domain that the case concerns.

Figure 3.1: Strategies for the Selection of Samples and Cases (Flyvbjerg 2006)

route, then this route is the process we need to understand. The point is that if the business plan was not decisive for the success of the venture, understanding of the effectuation process is needed to make sense of the student start up. For Venture Cup this would then mean that more emphasis must be put on the process of starting the venture - acting on the idea, than on the creation and communication of an idea and of a business plan.

So the choice of case to study has been "The Company". It was one of the first winners of Venture Cup. At present it has more than 200 employees. It has revolutionized two major industries with its novel application of technological solutions. Since Venture Cup chose "The Company" as having the best business plan, it can be assumed that the plan should have played an important role in the start-up. If not, then the case for the process, effectuation, will be validated and the research can show what happens when students decide to strike out on their own.

In order to conduct this case study, interviews will be made with the two founders and four members of the founding team. These interviews will be held in a semi-structured form with a frame for questioning. This frame is to work as a guideline for the interviewer, at the same time permitting the respondent to tell his or her own story, without being constrained by a questionnaire, since as long as the subject is dealt with, it has no consequence

Criteria for testing research design		
Test	Case-study tactic	Phase of research in which tactic occurs
Construct validity	Use Multiple sources of evidence	Data collection
	Establish chain of evidence	Data collection
	Have key informants review draft case study report	Composition
Internal validity	Do Pattern matching	Data analysis
	Do explanation building	Data analysis
	Do time-series analysis	Data analysis
External validity	Use replication logic in multiple case studies	Research design
Reliability	Use case study protocol	Data collection
	Develop case study database	Data collection

Figure 3.2: Criteria for testing research design (Yin 2008)

in what order the informant tells the story. For the interview frame see appendix I a and I b.

In order to assure quality in research, Yin (Yin 2008) has set up the following criteria to test quality of the research design. Figure 3.2 presents the criteria for testing research design which will be followed in this paper:

The above guidelines for achieving quality will be applied in the following way:

Constructing validity

Constructing validity has three components. First, use multiple sources of evidence, which is achieved in a variety of ways, illustrated below.

Documentation

The case study is done as interviews. These cannot be done in exactly the same way again, but all of them will be transcribed, and an exact transcript of the data will be provided. Therefore, what the informants said can be reviewed repeatedly. Even though the data have been collected for the purpose of this research, it will be possible to clear any possible doubts regarding my bias as a researcher by revisiting the original transcripts.

Archival records

Very few archival records have been found which could be used in the case study. Financial records as well as patent applications and patents granted can be retrieved, but the only other archival information will be material about the company already printed and published elsewhere. This material will be included whenever relevant to the research. Other materials

3. Method

such as letters, other correspondence and business plan entries for Venture Cup will be used so far as the company can make them available.

Interviews

These are used as the main source of information for this research. What is pursued in this case study is an in-depth interview with founders and the founding team. The interview is semi-structured, which in this case means that particular areas of research as well as the general story of the company will be illuminated. Under all circumstances, the informants' stories and interest in certain aspects of their operation will be decisive for the questions posed. It is the story of the participants which has to be told first and foremost, and this must hence take priority over a more structured interview protocol.

Observation

Since the case study takes place 10 years after the initial phase, the possibility of direct observation and participant observation is deemed uninteresting. It is impossible to observe the company in real time, but observing the participants today may have no resemblance to what they did and how they acted 10 years ago.

Physical artefacts

Though not very much can be concluded from the actual physical artefact, which is the product developed and sold, it is a very intricate part of the company history.

Chain of Evidence

Case study question → Case study protocol (linking questions to protocol topics) → Citations to Specific Evidentiary Sources in the Case Study Database → Case Study Database → Case Study Report (Yin 2008)

In order to maintain the chain of evidence, the question raised in the research, must be linked to the protocol, and from there to specific citations. The citations must link to the database and to the case study report. There seems to be a loop in the middle since you must be able to go both ways from the report to the question and from the question to the report. It would somehow seem more natural if the case study database was left out as a solitary stage. The case study database is the collection of information whereas the citations stem from the analysis of the information and hence constitute the basis of the creation of knowledge presented in the study report.

Internal validity

Pattern matching

It is very desirable for validity as it compares the pattern in the data with the predicted pattern. That is, if the case company has followed the business plan, then data from the plan, such as product development etc. can be compared with what actually happened. On the other hand, if the company

did not follow the business plan, then the only pattern matching available will be theory, e.g. effectuation. Since this is a single case study, the patterns in the case must be questioned in order to make sure that the pattern is formed by the actual causes exposed in the study, and not by another antagonist forcing the pattern to occur.

Explanation building

“Elements of explanations. To “explain” a phenomenon is to stipulate a presumed set of causal links about it, or illuminate “how” or “why” something happened. The causal links may be complex and difficult to measure in any precise manner. Even though Yin has reservations about how to explain, explanations are made, but they result from an iterative process. Though a definite operational procedure has not yet been established, Yin suggests that most probably work process involves:

1. Making an initial theoretical statement or an initial proposition about policy or social behavior
2. Comparing the findings of *an initial case* against such a statement or proposition
3. Revising the statement or proposition
4. Comparing other details of the case against the revision
5. Comparing the revision to the facts of *a second, third, or more cases*
6. Repeating this process as many times as is needed

In a single case study, the possibility of adding more cases is not relevant. Phase 1-4 outlines how this case study will be conducted, since it is a single case study. Phase 6 will be part of the process as well. This concurs very well with the demands for External validity – which calls for the use of theory in single case studies.

Reliability

There have been previous references to the annex for part of the research protocol, which will be established along with the research database.

3.2 “Conceptualization”

The aim of this paper and its main research question is how to conceptualize “effectuation”. The understanding of conceptualization is presented by Lars Bo Henriksen et al. in *Dimensions of Change – Conceptualising Reality in Organisational Research* (Henriksen, Norreklit et al. 2004) in the following way: “One of the main goals of this approach is to avoid definitions not stating

in advance what a phenomenon is but rather, using the research process to find out what the phenomenon is really all about.” “... but we allow the research process to decide and we allow our findings to help us conceptualise, give meaning and content to the key words that we emphasise”. “In order to create concepts that can show us organisational changes we need to turn to reality and a research process that is capable of conceptualising organisational changes.”

We know today that there is a theory of effectuation based on research into how very successful entrepreneurs make decisions. We know now that there are hypotheses about how inexperienced entrepreneurs who lack funding act but we do not know what actually happens. We know that the theory of effectuation has been used by Sarasvathy in teaching entrepreneurship for MBA programs but we have to examine the reality in order to be able to understand fully what this theory and term means.

To conceptualize effectuation then includes the case study of a company created by students, financed by them and what capital they were able to raise as well as developed and run by them. In the process of creating the company they took part in and won the Venture Cup. Choosing this case company may seem as a paradox for researching effectuation, since effectuation in its purest form tends to bypass the business plan, but it is the ideal place to see if effectuation comes into place and how.

3.3 Process perspective

The reason why the examination of the entrepreneurial process is so prominent in this research is that the business school approach to entrepreneurship tends to portray the process as a stage gate model (Cooper 1986), which granted solves the problem of when to do what but does not at all address the why and how. This is conveniently left to the people involved to solve and find out. And it makes the very big decision of starting a new venture into a stop-go decision, not a “how to overcome the hindrance” process. This research questions whether this decision can be made in this way or, as the theory of effectuation suggests, it is a decision process and a company building process occurring in a totally different way. This is not a new discussion. In the article *A Conceptual Framework for Describing the Phenomenon of New Venture Creation* (Gartner 1985)(Gartner 1988), the author describes the problem of handling venture creation and comes up with a framework for understanding the creation of a new venture, as shown in Figure 3.3. The framework for understanding new venture creation looks at the environment and organization as areas for analysis.

The organization in question can be understood in two ways: either as one created by the entrepreneur, or as the organisation which creates new ventures (intrapreneurship). The entrepreneur, called the individual in Figure 3.3, has been described in a multitude of ways. Gartner states that:

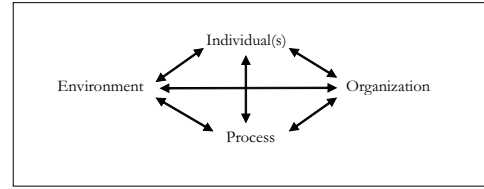


Figure 3.3: Framework for understanding the creation of a new venture (Gartner 1985)

“The entrepreneur is overwhelmingly perceived to be different in important ways from the non entrepreneur, and many researchers have believed these differences to lie in the background and personality of the entrepreneur.”

But are they different? It is not certain, since no one seems to be able to come up with a “marker for” entrepreneurship or a description of what makes an entrepreneur.

The last and, in this case, most interesting part of the framework is process: what it is that the entrepreneur does. The result of a literature review is a shortlist of six functions, which are:

1. The entrepreneur locates a business opportunity
2. The entrepreneur accumulates resources
3. The entrepreneur markets products and services
4. The entrepreneur produces the product
5. The entrepreneur builds an organization
6. The entrepreneur responds to government and society

(Gartner 1985)

This may or may not be a full description of things to be achieved in the process of creating a venture, but it has substantially less to do with the process than with the goals. If you consider the functions in the context of a stage gate model, it would fit nicely. However, if you see them as a process, it is only described as the arrows, illustrating an interaction but not the ways in which the interactions, the parts and the process create the new venture. It is a systemic framework in which process outcomes play a role

whereas the description of the process is only superficial. Since Gartner's article, process has been the focused of many cases, which will be reviewed in the chapter on theory. The problem is though that there seems to be no process description or understanding available for explaining what happens. Through the work with conceptualizing effectuation, a description of the process of how new ventures are created will become an integrated part of the research.

The process of entrepreneurship is not new to research. A lot of articles claim to address this issue. The only problem is that they are predominantly interested in setting up a model for creating a new business, but base it on a business plan approach. This will be elaborated on when addressing theory and literature review. This is not the type of process this research aims at describing. On the contrary, it is the process which goes on when, in this case, students leave the relatively calm and logical world of creating a business plan, designing and developing a product with a feasible market, and venture into the unknown. They leave behind analysis and start to act, start to do. This also means that no matter how well they have calculated the risks, this is the environment they have to act in instead of analysing. Also, no matter how good the product is, no matter how good the business plan is, without action it remains a theoretical exercise, which cannot be called innovation or entrepreneurship. So what happens when they decide to start and what is the process? We know what the word could mean, but apparently it still needs to be further conceptualized if knowledge about how students make new ventures is to be gained.

Since the "process" of entrepreneurship is part of the scope of this research, it is also essential to establish which theoretical approaches can be used for this purpose. This also means that any attempt at describing entrepreneurship has to factor in the process in order to be able to add information to this research. At the same time, the intention is to find an approach that allows the analysis of the how's and why's inherent in the process. The purpose is thus to achieve an understanding of the process of entrepreneurship and conceptualize effectuation in a single case study and subsequently combine it with a literature review of relevant theories, that is theories which can help conceptualize effectuation but also conceptualize the "process of entrepreneurship". When effectuation has been conceptualised together with an understanding of the actual student process involved in creating a new ventures, the knowledge will be compared to the principles of Problem Based Learning at Aalborg University, in order to see if these principles can concur with effectuation and the process of entrepreneurship.

When effectuation has been conceptualised together with an understanding of the actual student process involved in creating a new ventures, the knowledge will be compared to the principles of Problem Based Learning

at Aalborg University, in order to see if these principles can concur with effectuation and the process of entrepreneurship .

Theory

4.1 Introduction to theory

The theory in this study serves several purposes. To begin with, it gives an understanding of my preconceptions of the field of innovation and entrepreneurship, as it is was presented in the problem analysis, and will be investigated further in the following chapters. But as discussed previously, theory has another purpose when dealing with a case study research based on *a single case study*. Here, theory also functions as the ground on which findings can be tested. First, the choice of theories is influenced by the desire to work with the *process* of entrepreneurship – the *process* of creating a company. So, in order to be useful not only does the theory cover topics connected with the research question, but also it must deal with or enable an analysis of the *process*. Secondly, theory is the frame against which the case so to say can be mirrored. In chapter 3.1 it was shown that theory has this role in a single case study.

The search for theory started with researching three areas: entrepreneurship, learning and team. This was based on the understanding that entrepreneurship was not only to be seen as an individual achievement but could also be viewed as involving more founders and more people participating in the creation of the company. Since the scope of the research project is students, one must assume that in the process they learn things.

The first schematic looked like this:

As illustrated in the diagram, it was an-

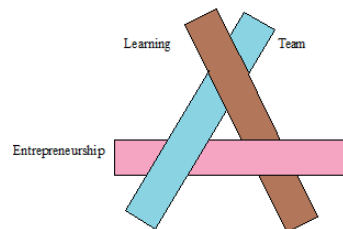


Figure 4.1: First schematic of Theory

anticipated that the theories not only had their own core in relation to the research but also that there would be overlaps between them.

After discovering the overlap and following further literature reviews it became clear that the topics of team, learning and entrepreneurship were immensely popular. Furthermore, they are addressed in nearly any area of research.

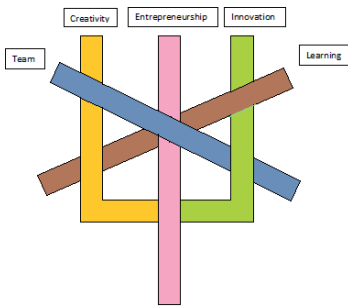


Figure 4.2: Second schematic of Theory

While doing the first literature review, it became evident that a more precise definition of the term entrepreneurship was needed. Therefore, Schumpeter’s and Drucker’s approaches were adopted. The term “innovation” was introduced. With innovation came the question of how to distinguish innovation from creativity, which was also addressed. The literature review also showed that entrepreneurship and innovation were interlinked both with each other and nearly any other related term you may use for a literature search. As a result, the model looked like Figure 4.2.

Figure 4.3 illustrates in a crude way how the different angles of theory overlap and interconnect with each other. But what has to be kept in mind is that it is not the sum of theories and interconnections which constitutes the theoretical foundation. Conversely, the areas of the theory have a profound impact on the process of entrepreneurship, effectuation and learning. As stated earlier, when addressing education, learning will be defined as Problem Based Learning.

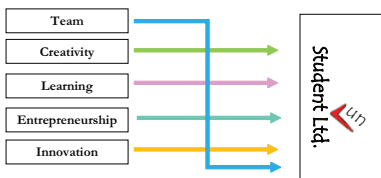


Figure 4.3: Final Schematic of Theory

For analysing the process, a review of network actor theory will be undertaken.

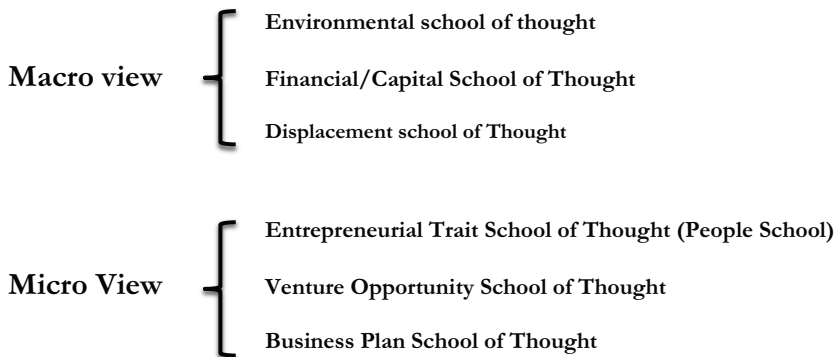
4.2 The roots of entrepreneurship

Why is entrepreneurship so interesting? Because for many people entrepreneurship is the foundation of the creation of wealth in our society. In its basic form entrepreneurship means the creation of a new company with the purpose of making a profit. This, in turn, makes it interesting for

economists dealing with macroeconomic, as the foundation of future wealth can be found here. Since Adam Smith (Smith 1966) published his essay *The Wealth of Nations* in 1776, the function of “the invisible hand”, as Smith termed it, has been under scrutiny. Smith observed that somehow capital was moved from one industry, venture or area to another. He did not describe how this was done, hence the term “the invisible hand”. His focus of interest was the wealth of nations, not by whom it was created.

Kuratko (Kuratko & Hodgetts 2008) discusses the origin of entrepreneurial research. In order to handle the approaches, they mention the divisions and subdivisions listed below. The list showing The Schools of Entrepreneurial Thought comprises researchers with a given approach/focus, and the subject they study is either the macro- or the micro view of furthering entrepreneurship. (Kuratko & Hodgetts 2008) discusses the origin of entrepreneurial research and in order to handle the approaches uses the divisions and subdivisions, below. The School of Thought is then comprised of the researchers with that given approach/focus, and the subject, is then the entrepreneur.

The Schools of Entrepreneurial Thought:



As a framework, The Schools of Entrepreneurial Thought work relatively well although there seems to be some overlap. This could be due to a somewhat unconventional approach to the term macro:

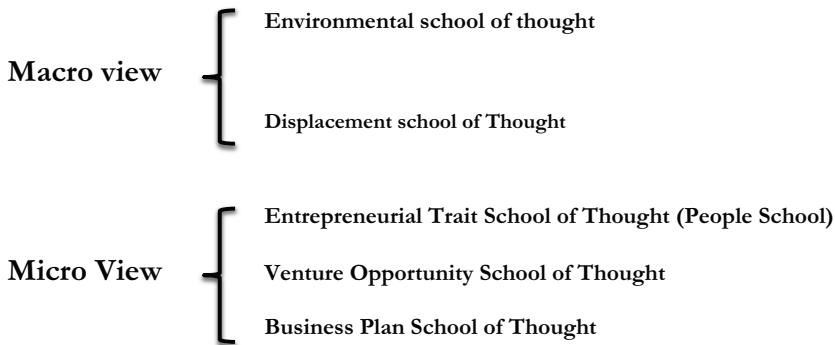
“The **macro view of entrepreneurship** presents a broad array of factors that relate to success or failure in contemporary entrepreneurial ventures. This array includes external processes that are sometimes beyond the control of the individual entrepreneur, for they exhibit a strong external locus of control point of view. “

If the understanding of the macro level had been factors which were beyond the entrepreneur’s control, the model could be more precise. How-

ever, a contradiction occurs with regard to the Financial/Capital School of Thought. As understood by Kuratko et al., this school deals with the process of seeking capital. Granted, the entrepreneur cannot affect whether a market has capital available, but it is very much within the realm of entrepreneurial decision to decide about the process of acquiring capital. Therefore this school should be placed under the microlevel, which is understood in the following way:

“The **micro view of entrepreneurship** examines the factors that are specific to entrepreneurship and are part of the **internal locus of control**. The potential entrepreneur has the ability, or control, direct or adjusts the outcome of each major influence in this view. “

This leads to a model which looks more like this: The Business Plan



School of Thought covers divisions Strategic and Capital/Financial, which can be viewed as intertwined. It is composed of a strategy for the new venture and a financing plan. At the same time it is a crucial tool for the financing endeavour.

4.2.1 Environmental School of Thought - The classic economist school

In its most basic form, entrepreneurship is the creation of a new company with the purpose of making profit. This, in turn, makes it interesting for economists dealing with macroeconomic, as the foundation for future wealth can be found here. Since Adam Smith published his essay on *Wealth of Nations* in 1776 (Smith 1966), economists have tried to explain economic growth. The first to truly attribute it to entrepreneurs was Schumpeter (Schumpeter 2008), who in his 1942 publication claimed that economic growth of a society is closely related to the function of the entrepreneur –

in how efficiently capital is allocated. Schumpeter used the term creative destruction to describe how the process of changes occurred when new ventures were started, killing old companies by reallocating resources: capital and manpower. Kirzner (Kirzner 1978) continues this economic angle as he introduces his unequilibrium approach to understanding entrepreneurship. Economists provide no understanding of the task of the entrepreneur in risk management, alliance building, learning processes, etc. but they view the process merely from a market perspective. This, in turn, leads to the analysis of how nations can help with the creation of new enterprises, demonstrated in the original IKEA project at AAU. (Lundvall, Johnson et al. 2002)

The above mentioned researchers give no insight into the actual entrepreneurial/intrapreneurial work. They are seen as the founders of the field of study and you may say the first “focus” of understanding entrepreneurship.

4.2.2 Displacement School of Thought

Kuratko et al, argues that this school contains three major types

1. *Political displacement* can be understood as regimes against free enterprise to governmental regulations and policies which limits and redirect certain industries.
2. *Cultural displacement* “This deals with social groups precluded from professional fields. Ethnic background, religion, race, and sex are all examples of factors that figure in the minority experience.”
3. *Economic displacement* is simply when the economy forces individuals to pursue other careers than they first intended.

As a grad student I witnessed the first boat refugees from Vietnam arrive in Aalborg. Some of my fellow students got involved in helping them. As a marketing student I was called upon to help a tailor set up shop. The students involved were concerned that the shop would be very boring, with the tailor sitting in the back room doing all the fittings and sewing, so the shop would look either like a dry cleaners or a very empty boutique. I came up with the solution to put the tailor on a table in front of the shop window, sitting tailor-style doing his job. This attracted a lot of attention. The local newspaper wrote about it, and over the years the tailor became a wealthy man. The question is whether he became an entrepreneur because of political displacement. One could claim he did, but not as it is understood in Kuratko’s context, nor was it a result of cultural displacement. Had there been vacant jobs as tailors or in the garment industry, he could probably

have been hired. Why he had had his own tailor shop in Vietnam, one can only guess. It could result from the environment, e.g. it was expected of him. The fabric of the Vietnamese economy might have consisted of small shops. But the reason he came to Denmark was because a Danish shipping company Maersk issued orders that no boat refugee was to be left to their own devices but the person was to be helped. As a Danish ship was sovereign territory, Denmark could and did offer asylum. The tailor's lack of command of Danish made it necessary for him to work on his own (in relation to the models regarding cultural and ethnic background). His background with his own shop might have facilitated it. The general poor job conditions in 1981 (addressed in the model as economic displacement) have probably influenced the decision. It was under no circumstances the intention of a budding entrepreneur in Vietnam to come up with a plan to sail a small boat out to the big shipping lanes, be picked up by a Danish ship and in this manner get to Aalborg to start a new venture. It was a result of a lot of geo-economics and strategic defence plans, which ended up with this outcome. The entrepreneur, or the tailor, just acted upon them and used the skills he had to feed his family.

In a modern context, the lack of jobs for new graduates could be the trigger for establishing new ventures during the present downturn of the economy. As we saw, the economic boom in the late 90s and at beginning of the new millennium could be the cause of establishing new ventures. In the dot.com days students may have viewed a job as something you could always get, but the chance to start your own company was right there and right then. So even though the School of Entrepreneurial Thought only refers to the effect of a bad economy, it seems a somewhat limited scope, since companies also get started in more affluent economic times. It would therefore seem prudent to see if the case company was in any way influenced by the prosperous times or strong economy when they started.

4.2.3 Entrepreneurial Trait School of Thought (People School)

The idea that what makes someone become an entrepreneur has something to do with the entrepreneur's background, education, family, nationality etc. is not new. And if successfully defined, these characteristics would give the society a description of how to create entrepreneurs, provided that their traits and background are also desirable and acceptable in the particular society. With respect to defining characteristics of an entrepreneur, Barton Cunningham and Licheron make the following distinction: (Cunningham & Lischeron 1991)

Assessing Personal Qualities

1. The "Great Person" School of Entrepreneurship
2. The Psychological Characteristics School of Entrepreneurship

The "Great Person" School is about the unique individual who creates the company. Just looking at the Danish publications, there have been a lot of books about entrepreneurs and their lives.¹ Some are about people who started their own companies, while others about people who have risen to high positions in business. In the note, you can see books in Danish about Steve Jobs, and a list of books about Danish entrepreneurs and top managers. When I was a teenager, my favorite book was titled William S. Knudsen, which was the story of a Danish blacksmith who immigrated to the US and became first in charge of production at Ford Motor Company. After a fallout with Henry Ford, he joined GM and eventually became the president of the company. He accepted an invitation from President Roosevelt to direct industrial production in the National Defence Program of World War II. People like that are certainly interesting, but books about them have a tendency to be a bit hero worshipping. Whether it is national pride or fascination with people doing grand things is debatable, but the interest in these people and what makes them great is definitely there, no matter if in business, politics or war.

Naturally, researchers have attempted to examine what these people have in common, but so far the results have been negligible. No short list of characteristics has come up, and in the research of the process of starting a company, the input could only be used for the purpose of checking if the founders exemplified the characteristics found by the researchers.

In his work *Innovation and Entrepreneurship* from 1985, Drucker states (Drucker 2007): "Most of what you hear about entrepreneurship is all wrong. It's not magic; it's not mysterious; and it has nothing to do with genes. It's a discipline and, like any discipline, it can be learned." In spite of this rather blunt dismissal of an entrepreneurial gene, a lot of research has been put into proving him wrong. Nevertheless, so far no one has been able to come up with a solution to this problem.

What is it that entrepreneurs do? They create companies. In his article "*Who is an Entrepreneur? Is the Wrong Question*", (Gartner 1988) Gartner outlines the two approaches. In behavioural approaches to the

¹ Books like Steve Job (translated to Danish), Bosse – one of the first female Danish CEO for a big Insurance company, Aamund started his own bio tech company, Arvtageren . Niels Due Jensen (Grundfos), Iværksætter til jeg dør (founder of Jubii), Hr. Møllers nye mand (about the new ceo of Maersk), Mærsk (majority owner of Maersk) H.N. Andersen (the founder of Eastern Asiatic Company) Men morsomt har det været - (self biography by Flemming Juncker – who founded an industrial group, and was during the second world war part of the Allied SOE network in Denmark – heading Jutland)

study of entrepreneurship, an entrepreneur is seen as a set of activities involved in organization creation, while in trait approaches an entrepreneur is a set of personality traits and characteristics”. Gartner argues that the search for common traits of an entrepreneur is bound to be fruitless. This can be confirmed by an extensive literature review. Also Sarasvathy follows this line. She says that studying entrepreneurship differs from research in other areas, since no scholar of accounting og general management starts out with researching why some people become accountants while others do not. (Sarasvathy 2004b)



Figure 4.4: Founding Team Microsoft

This is followed by Fayolle in his work *Entrepreneurship and New Value Creation* where he says “Various typologies of the entrepreneur have been proposed in entrepreneurial literature, but their multiplicity does not help distinguish an ideal or scientific profile of the entrepreneur.”

Many attempts have been made to narrow down the defining characteristics of entrepreneurs. One of the more curious claims is:

“Other traits frequently mentioned include physical attractiveness (including height, weight, and physique), popularity and sociability, intelligence, knowledge, judgment and fluency of speech; also tact, diplomacy, and decisiveness.” (Cunningham & Lischeron 1991).

However, if you look at the two pictures of the founding team of Microsoft, you may wonder if something should be changed in the above quotation. Figure 4.4, Founding Team Microsoft may not fulfil the demands of physical attractiveness, so you may wonder how the founding group in Microsoft pulled it off. But they did. (Pictures from Microsoft.com)



Figure 4.5: Recent picture of Microsoft Founding Team

Starting a company as a grad student and over the years growing it into a leading company in its industry is definitely worth respect. Still, it would help understanding the process if we could come up with a profile of the entrepreneur and blueprint it for potential entrepreneurs. Maybe then, we could consider their decisions in the light of their compatibility with the blueprint.

What can be concluded is that since there are no psychological traits which with any certainty can describe the action and reaction pattern of the entrepreneur the People School has little to offer to those researching the process, other than the fact that entrepreneurs who do create companies, do create companies, which is rather self-evident.

4.2.4 Venture Opportunity School of Thought

Kuratko (Kuratko & Hodgetts 2008) understands this school of thought in the following way: it “Focuses on the opportunity aspect of venture development. The search for idea sources, the development of concepts, and the implementation of venture opportunities are the important interest areas for this school. Creativity and market awareness are viewed as essential. Additionally, according to this school of thought, developing the right idea at the right time for the right market niche is the key to entrepreneurial success.”

When we discuss creating a new venture based upon an opportunity, it is important that the understanding of the term opportunity is in alignment with the understanding of entrepreneurship as introduced by Peter Drucker in 1985 (Drucker 2007), where he made the distinction between being self-employed and being an entrepreneur. He states that the entrepreneur has to base his enterprise on an innovation. Otherwise, he is merely self-employed. But entrepreneurship is a discipline, and like any other discipline it can be learned. This places the access to innovation with the entrepreneur and it puts the entrepreneur in charge of the process. A true entrepreneur is someone who is able to found a new venture on an innovation. Hence, in Kuratko’s optics, the innovation must be the opportunity. Then, in order to conform to Drucker’s classification, the search for new ideas must lie within the realm of innovation areas, of which there are seven; 1. The Unexpected, 2. Incongruities, 3. Process Need, 4. Industry and Market Structures, 5. Demographics, 6. Changes in Perception, 7. New Knowledge. (Chiles, Gupta et al. 2008)

1. The Unexpected is not the result of a deliberate action on part of the entrepreneur/innovator, but may come by chance. The pharma industry witnesses many such incidents. For instance, Novo Nordisk, with Novo Seven initially intended for treating haemophilia, which turned out useful in trauma situations when patients haemorrhage. Another example is their diabetes treatment, which also has an effect on overweight. This drug may become bigger than what Novo is doing at the moment, and in keeping with the Schumpeterian tradition, it may even change a whole industry. The most commonly known example is probably Pfizer’s Viagra, which was intended as a heart medicine but

had other side effects considered more beneficial than its impact on the heart condition.

2. **Incongruities.** In Drucker's own words, "an incongruity is a discrepancy, a dissonance, between what is and what 'ought' to be, or between what is and what everybody assumes it to be."
3. **Industry and Market Structures.** We have seen the changes in retail, where individual shops used to sell dairy products, groceries, meat and bread. Now, we have supermarkets. Not so many years ago, mobile phones were fitted into people's cars, whereas today even preschool children have them. The knowledge about using computers and internet is sometimes bigger outside the industry than within, which causes changes due to innovation.
4. **Demographics.** Europe and Japan are getting old, which leads to the emergence of new industries and new ventures. Medical products and especially care systems, including facilities, are a Danish export area.
5. **Perception.** Just like demographics are changing, so is the perception of age, and what you can do at certain ages. Nowadays, the perception of normality is changing. The norm used to be a nuclear family, but there has also been communal living and today the new norm seems to be life as a single. The percentage of single households is on the rise. According to the US census, 31.4 million people lived alone in 2012. They comprised 27 percent of all households, up from 17 percent in 1970. Also, patterns of living and consumption are changing. Due to the high cost of living in Japan, we have seen the emergence of a phenomenon called "a parasite single", which is a young single living with his or her parents in order to afford a carefree and comfortable life.
6. **New knowledge.** The term is self-evident. It creates new solutions, new products and new markets. It is what academia is expected to achieve, as it gets ideas for marketable products from research results. The process was referred to in chapter 1.0, regarding a new research policy.
7. **The Bright Idea.** It is as accidental as the unexpected. The bright idea may have flaws, but it may gain fast acceptance. Alternatively, it may be discarded for a variety of reasons e.g. timing.

Another angle that addresses the issue of innovation and opportunity is represented by Timmons. Timmons's (Timmons & Spinelli 1999) kick-off

point is the differentiation between an idea and an opportunity. Ideas are so to say a dime a dozen. The task is to separate ideas from opportunities, which have the following characteristics:

1. “They create or add significant value to a customer or end-user.
2. They do so by solving a significant problem, removing a serious pain-point, or meeting a significant want or need-for which someone is willing to pay a premium.
3. They have robust market, margin, and money- making characteristics that will allow the entrepreneur to estimate and communicate sustainable value to potential stakeholders.” (Timmons & Spinelli 1999)

Compared to Drucker, Timmons uses the term “sea-changers” as areas where opportunities are born. Those are Technology, Market, Societal, Brontosaurus and Irrational Exuberance. (See appendix VIII, Timmons Sea-Changer). The terms below bear resemblance to Drucker’s classification:

1. Technology resembles Drucker’s “New Knowledge”.
2. Market equals the market in Drucker’s “Market and Industry”.
3. Brontosaurus is an opportunity for Schumpeterian creative destruction. Hence, it includes Drucker’s “Incongruities” and “Market and Industry Changes”.
4. Irrational Exuberance is understood as undervalued assets.

Another development from this school of thought is the previously described Corridor Principle. New pathways or opportunities will arise and lead entrepreneurs in different directions. The ability to recognize these opportunities when they arise and to implement the necessary steps for action are key factors for entrepreneurs. The basic assumption of the Corridor Principle is the maxim that preparation meeting opportunity equals “luck”. Proponents of this school of thought believe that proper preparation in the interdisciplinary business segment will enhance the ability to recognize a venture opportunity.

A set definition of areas where opportunities can be found is hard to come by. The interesting thing is though that it is not a result of stumbling into an idea/opportunity, which by the way Drucker does not discard. An opportunity can very much be a result of a determined and organized search for opportunity/innovations.

4.2.5 The Business Plan School

When researching entrepreneurship literature, especially literature aimed at teaching entrepreneurship, the business plan holds a very central position. There is a de facto standard for the content of such a plan, which can be seen in publications intending to help entrepreneurs. A search for business plan templates yields 35,000,000 hits on GOOGLE, whereas a search on Amazon.com for Business Plan yields 83,741 hits, including *Writing a Business Plan: The Basics*, by Harvard Business Press, 2005. No matter who has produced the template, they generally follow the same format.

Venture Cup, which plays a key role in this study, asks their students to come up with a plan of max. 15 pages containing the following:

1. Summary and Contact
2. Product and Service
3. Market and Customer
4. Industry and Competition
5. People and Organization
6. Money and Feasibility
7. Implementation
8. Budget
9. Extra

This content is found in a lot of business plan templates, for example in stand-alone software solutions such as Business Plan Pro or in textbooks such as Kuratko et al (Kuratko & Hodgetts 2008), Timmons et al (Timmons & Spinelli 1999), etc. It is indisputable that if you are to start a new venture the convention demands that you write a business plan. In a business context this is probably due to the fact that if you want to attract investors or borrow money, you need to play by the rules. An example can be found on the homepage of Canada Business Network, where they refer entrepreneurs to four major Canadian banks and their free business plan templates. Danish organizations such as startvaekst.dk, an organization established to help people start their own company, have both on-line service and pdf-files available for download. The two biggest Danish banks, Danske Bank and Nordea, do not make these services readily available. This does not mean that they do not demand them. In fact, they do. Startvækst promotes them, and a

quick search reveals that there are a lot of consultants helping people make a business plan which complies with the demands of the banks.

Why is it then that a business plan is in such demand? Probably, because banks and investors need to have a history of the company, such as old annual reports, tax statements, etc. in order to evaluate the risk they are going into. Since the new venture has no history, a proper research is called for. Loans for existing corporations are based on their ability to pay back, estimated through a feasibility study. And the business plan is just that to investors and banks – a feasibility study assessment of the company's/entrepreneur's ability to pay back the loan.

Within educational system, the concept of a business plan has played a big role in entrepreneurship education. Earlier in this paper, it was demonstrated how textbooks are dealing with business plans as part of entrepreneurship education. Kirketerp (Kirketerp 2010) discusses this in her dissertation about entrepreneurship pedagogy and didactics. She places the business plan in an educational setting as a professional competence, and sees the plan as a causal prediction of events to come, whereas academia evaluates it as reproduction of knowledge with focus on analysis. Hence, a business plan becomes the ideal tool to incorporate in an educational setting. Universities are so to say geared to describe everything from learning goals to evaluation criteria when dealing with a business plan, and if economics is taught at the institution, know-how and teachers are readily available.

As other parts of this introduction to theory will show (see chapter 4.2.6. Entrepreneurship as Process), it is not the plan, but the decisions the entrepreneur makes which create the company. Kirketerp (Kirketerp 2010) discards the importance of the business plan in favour of effectuation, which will be described in chapter 4.2.7. As can be seen in a situation where the entrepreneur has to attract funds, either as invested capital or loans, the business plan is a key ingredient. So the knowledge of making a strategy, a marketing plan, budgets and financial plans is probably not to be discarded as easily in practice. Yet, it is probably not the outcome but a means to achieve the desired outcome, which must be the creation of a venture and the realization of an idea, seizing an opportunity.

4.2.6 Entrepreneurship as a process

Instead of viewing entrepreneurs as having distinct qualifications, entrepreneurship could also be viewed as a process. The focus is then on how the company was created and not on who did it.

“If we are to understand the phenomenon of entrepreneurship in order to encourage its growth, then we need to focus on the pro-

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cess by which new organizations are created. This may seem like a simple refinement of focus (i.e., look at what the entrepreneur does, not who the entrepreneur is) but it is actually a rather thoroughgoing change in our orientation. From this perspective, other issues in the field might be seen with new clarity.” (Gartner 1988)

Regarding what constitutes the process, the view of Gartner (Gartner 1985), which has previously been introduced, can be presented as the following simplified model, see Figure 4.6.

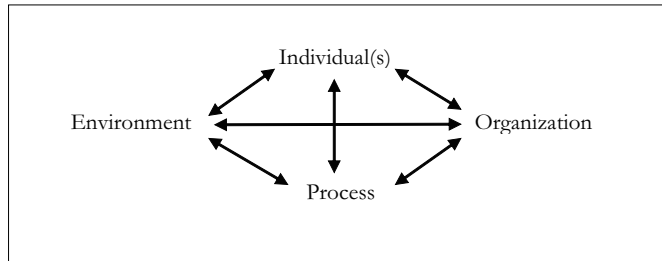


Figure 4.6: Process of venture creation (Gartner 1985); for a more detailed view look at appendix VI

Gartner describes process as;

1. Locating a business opportunity
2. Accumulating resources
3. Marketing products and Services
4. Producing the Product
5. Building an Organisation
6. Responding to government And Society

As can be seen in Appendix VI and the previous Figure, there is an interaction between the environment, individual, organisation, and not surprisingly, the process. For Gartner, the outcome is of course the venture/organization. But even though it looks like a to-do list, Gartner states that it is not in any way sequential or listed in order of importance. Nevertheless, it seems that there could be a logical order of things.

“There is a growing awareness that the process of starting a business is not a single well-worn route marched along again and again by identical entrepreneurs (Hartman, 1983). New venture creation is a complex phenomenon: entrepreneurs and their firms vary widely; the actions they take or do not take and the

environments they operate in and respond to are equally diverse - and all these elements form complex and unique combinations in the creation of each new venture. It is not enough for researchers to seek out and focus on some concept of the "average" entrepreneur and the "typical" venture creation. New organizational forms evolve through variation, and this variation in new venture creation needs to be studied (Aldrich, 1979; Hannan & Freeman, 1977; Pfeffer & Salancik, 1978; Weick, 1979) " (Gartner 1985)

In his work *Entrepreneurship and New Value Creation* (Fayolle 2007), Fayolle says the following about the focus on an individual-based approach:

"Approaches concerned primarily with individuals are regularly subject to criticism, and a memorable debate shook the community of entrepreneurial researchers at the end of the 1980s. It opposed Gartner (1988) and his approach of entrepreneurship focused on organization creation (How) and Carland et al. (1988) and their trait-based approach (Who). Stevenson and Jarilla (1990) suggest that it is difficult to model and explain a complex behavior (entrepreneurship) by relying on a few psychological or sociological traits. This realization is gradually gaining currency and leading researchers to refocus on entrepreneurship processes." (Fayolle 2007)

A few attempts have been made to come up with a model about the process. Morris, Lewis and Sexton have devised what they call an input-output perspective on entrepreneurship. For a more detailed model, please look at Appendix III.

According to their theory, the entrepreneurial process is limited to the following steps:

- Identifying opportunity
- Assessing and acquiring necessary resources
- Implementation

Comparing it to Gartner's research, the only difference is the condensation of the tasks. Neither model analyses what takes place, which is the

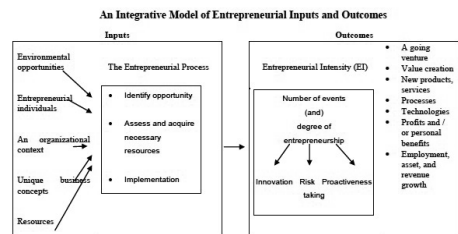


Figure 4.7: Input Outcome Model

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process. The models focus on the task to be worked with, which correspond to gates in a stage-gate model.

Figure 4.8 Timmons Model of Entrepreneurship (Timmons, Spinelli 1999), adds a couple of interesting new aspects to the entrepreneurial process. First of all, we see that the function of the founder (entrepreneur) involves the job of balancing all the forces, which sometimes cooperate and sometimes oppose one another. In Timmons's process model there are four major forces: The Founder, The Opportunity, The Team, and the Resources.

The founder has been dealt with before in the passage about Entrepreneurial Trait School of Thought.

The Resources, or rather gathering of same, are part of every entrepreneur's function. The Opportunity will be further described in the chapter about Venture Opportunity School of Thought. But the new factor, Team, is interesting. It takes the focus away from the individual and turns it towards the group which in some way the entrepreneur has to get interested in the new venture.

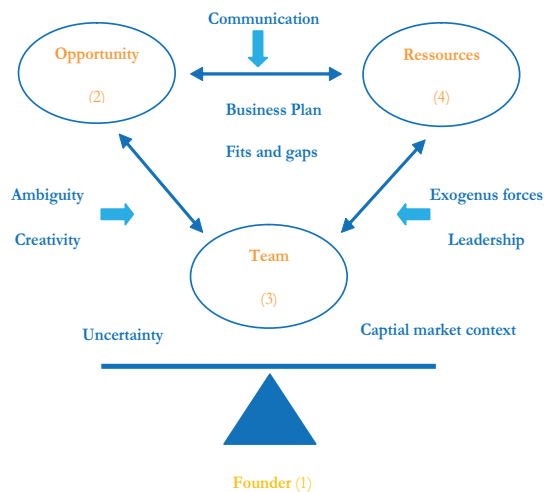


Figure 4.8: Timmons Model of Entrepreneurship represented in Figure 4.8, is very much aimed at defining an entrepreneur who is trying to attract venture capital (hence the capital market context), placed in the lower right corner on the balancing board. Timmons acknowledges the business plan both where it fits with and diverges from the opportunity and the resources available. Looking at the tasks to be performed under resources and opportunity, it gives a very clear picture of a start-up, which requires a lot of capital from day one. In this context, it is no surprise that the business plan is important in the model and is considered a resource. Subsequently, Timmons introduces the team into the equation. It is not an entrepreneur himself who goes into the lab, develops an invention into a new and marketable product, and afterwards makes the business plan, finds the resources, etc. Obviously, the entrepreneur is involved, but he or she has a team to support the process. Introducing the team

as a part of the entrepreneurial process is attributed to venture capitalist John Doerr, who reaffirms General George Doriots's dictum: I prefer a Grade A entrepreneur and team with a Grade B idea, over a Grade B team with a Grade A idea. Doerr stated "In the world today, there is plenty of technology, plenty of entrepreneurs, plenty of money, plenty of venture Capital. What is in short supply is great teams. Your biggest challenge will be building a great team." (Timmons, Spinelli 1999) Doerr went on in the interview saying "There's enormous change underway in every facet of the world. Some is technology driven, some is market driven. All that change creates unprecedented opportunity. But to take full advantage of those opportunities, focus on the team. Teams win." (Malone 1997)

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Gartner	Morris, Lewis and Sexton	Timmons
<p>Locating a business opportunity Accumulating resources Marketing products and Services Producing the Product Building an Organisation Responding to government And Society</p>	<p>Identify opportunity Assess and acquire necessary recourses Implement</p>	<p>The Entrepreneurial Process Is Opportunity Driven Market demand is a key ingredient to measuring an opportunity:</p> <ul style="list-style-type: none"> • Is customer payback less than one year? • Do market share an growth potential equal 20 percent annual growth and is it durable? • Is the customer reach able? <p>Market structure and size help define an opportunity:</p> <ul style="list-style-type: none"> • Emerging and/or fragmented? • \$50 million or more, with a \$1 billion potential? • Proprietary barriers to entry? <p>Margin analysis helps differentiate an opportunity from an Idea: Low cost provider (40 percent gross margin)? Low capital requirement versus the competition? Break even in 1-2 years Value added increase of overall corporate P/E ratio?</p>

In research, a lot of focus has been devoted to the entrepreneur, the environment, the opportunity, etc., but for a long time the team as the first group of employees has been viewed as ordinary employees. However, if

you look at the description of the characteristics of the team, its qualities must greatly overlap with the desired qualities of an entrepreneur. The team joins the company at a very fragile point, at which it cannot be predicted where it is going and how it will develop. Resources may be adequate, yet again they may not. Members of the team take a chance, which may not be as big as the entrepreneur's/owner's – but they may end up without an income. What is it that makes these jobs so interesting that some people give up good careers with good prospects for the future? Are they so say entrepreneurs light, since they participate but take no financial risk except the possible chance of a loss of income, or are they attracted by other things, maybe the technology, the product or the composition of the group? Since the team is so necessary, this subject will be dealt with further in the chapter on the team.

So far, even though the process is not clear, the actors in the process and the interaction between the different fields have been specified.

Comparing the three models, by Gartner's, by Morris, Lewis and Saxton and by Timmons, the understanding of entrepreneurial process is still very much a stage-gate model.

Gartner's research showed the tasks involved, but not necessarily in the order of appearance. This gives room for an iterative model, where the entrepreneur may have to jump between the individual tasks, going back and forth. Lewis et al (Morris, Lewis et al. 1994) present a shorter model, which more or less has left the "business plan level" and moved to a stage focused on implementation. In a strategic context, that would mean you should do what has been planned. Even though Timmons has expanded the participant category in the model and has described the founder/entrepreneur as the one who has to balance the different demands, it is an acknowledgement that a process is taking place, but as such not a model of the process.

One last model to be reviewed is by Saras Sarasvathy. Her view on the process is as follows:

The **entrepreneurial process** transforms an idea into a firm.

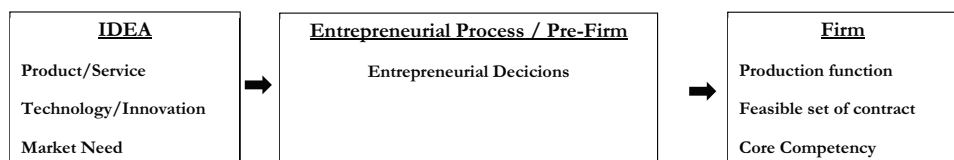


Figure 4.9: The Entrepreneurial Process

The key insight here is that the entrepreneurial process is a *pre-firm* process.” (Sarasvathy 1998)

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The reason for this is that for the entrepreneur the process is either to establish a feasible company, or to abort the idea. The decisions that the entrepreneur has to address four issues, and the entrepreneur cannot make these decisions separately. According to Sarasvathy, the decisions are interconnected, whereas Timmons sees the entrepreneur as the balancing point of the “scale” for the process. Sarasvathy displays this interconnectivity through a theory approach, which consists of the following four domains:

1. Recourses
2. Stakeholders
3. Environment
4. Entrepreneur

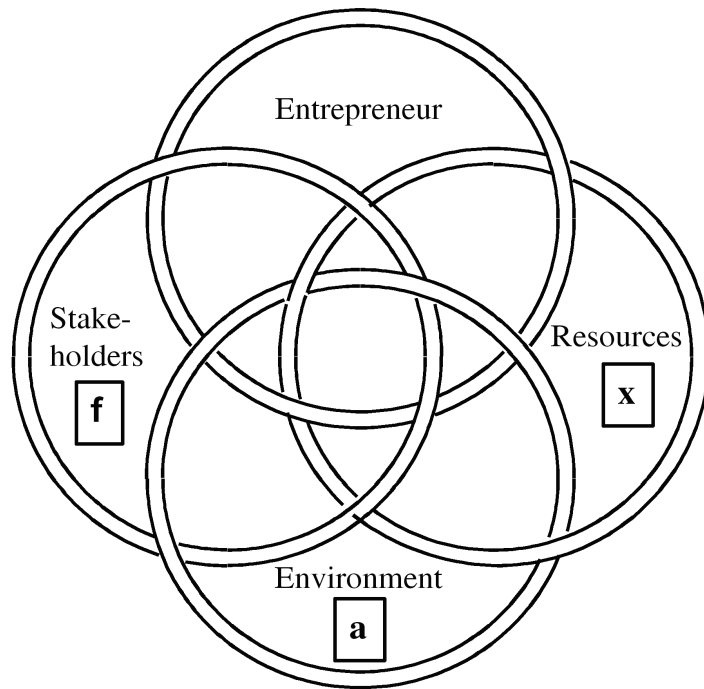


Figure 4.10: Interconnected causal domains for entrepreneurial decisions

According to Sarasvathy, “the four entrepreneurial decision domains have the following characteristic interconnections:

1. Every instance of an entrepreneurial process involves all four domains. In other words, every pre-firm is faced with decisions originating from all four domains.

2. While every entrepreneurial decision may originate in one or more of the four domains, each of those decisions involves elements of all four domains. Therefore, no entrepreneurial decision can be non-trivially studied or modeled without reference to all four domains.
3. There is no order or seriality to the four domains – that is, none of the four domains have primacy or priority over the other three. There is no pre-specified order in which the pre-firm may be faced with its entrepreneurial decisions.” (Sarasvathy 1998)

In point 2, Sarasvathy argues that the decisions cannot be studied as individual objects. Given that decisions are seen as the function or a process of/for the entrepreneur, Sarasvathy agrees that you cannot “separate the dancer from the dance”, as Gartner quoting Yeats puts it. She claims that if you want to understand the company which already exists, you have to understand the decisions made in the pre-firm phase of establishing the company. In order to describe the process, she refers to the process of establishing U-Haul, a one way rental of moving vans and trucks:

1. Decisions involving resources

How many moving vans/trucks should the founder buy?

How many locations would he need to open?

2. Decisions involving stakeholders

How many employees should be hired? (One per location? Or more?)

Who should the founder raise the capital from?

3. Decisions involving the environment

Should the founder open a few locations regionally or go national at once?

How should he establish his market presence? Should he advertise? If so, how?

Putting it all together, how should he price the product?

From the above, it would seem that the domain of the entrepreneur is left out. In fact, it is not. The decisions are made by the entrepreneur, so his or her preferences are very much the basis of the outcome. Had the founder of U-Haul wanted to maintain a large part of the ownership, the company’s growth rate would have been limited by his private financial situation and his ability to borrow money. Had he wanted to own his outlet facilities, the limitations would be the same. In reality, by accepting not to have a large and

decisive ownership, he permitted the company to grow. Had he not made that decision, he would probably have owned 100% of a very small company. Choosing as he did permitted him to own a smaller part of a substantially larger company. This is in no way to argue that everything hinges on who the entrepreneur is, neither is it to neglect the issue, but it means accepting that what kills or makes a successful start-up is founded in the pre-firm decision process.

Therefore, more focus must be given to how the process unfolds in the start-up phase. Moreover, what drives the participants, the founder, the team and the financier must be further researched.

4.2.7 Effectuation

As a principle in the entrepreneurial process, effectuation was established by Saras Sarasvathy, who describes it as follows:

”Process of Causation and Effectuation

Definition:

Causation processes take a particular effect as given and focus on selecting between means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means.” (Sarasvathy 2001a)

So far in this chapter on the theory of entrepreneurship we have seen causal approaches, which are trying to predict the future and establish a given desirable goal. The most predominant of these is the previously mentioned Business Plan School of Thought. Effectuation, on the other hand, has the opposite approach. It starts with the means, and then looks at what outcomes can be created with the given set of means available to the entrepreneur.

The theory of effectuation was a result of the work Sarasvathy did for her Ph.D. dissertation. It was based on 27 entrepreneurs, who had created companies with turnovers ranging from \$ 250 mill. to billions of dollars. These entrepreneurs were asked to solve a range of problems in a talk-aloud session. The conclusion from these answers was that they did not only rely on causal approaches, as they were taught in business plan classes, but also on effectuation. The main purpose of the Business Plan School is to create the best possible business. But as the research showed, the entrepreneurs do not exclusively base their business decisions on a causal approach, but still they can be extremely successful. Her next question is then whether the entrepreneur has to build the best company or the best company the

entrepreneur can build. The rationale behind is that attracting the capital necessary to build the best company may hinder the actual start of a company (Sarasvathy 2001a; Sarasvathy 2004a). Sarasvathy argues that the creation of a company does not exclusively happen as a non-negotiable entity decided by the entrepreneur, as described by Honig (Honig 2001). Sarasvathy maintains that it is an ongoing process between the founder and the people either hired or cooperated with, much like Honig argues is the case for the intrapreneur.

The difference between effectuation and the Business Plan School is the fact that the goal is not to build the best possible company, but to start with the entrepreneur. It is not a question of who he or she is, as in a search for distinguishing characteristics, but an understanding of the entrepreneur as to what he or she can draw upon in the process of creating a new venture. Questions such as “Who are you?”, “What do you know?”, “Whom do you know?”, “How much can you afford to lose?” all stand in a dire contrast to the whole purpose of the business plan.

The relevance of effectuation is that it focuses not on the academic skills of writing a business plan, but on the individual’s ability to create a company with what the founder has. A common criticism is that higher education seems to hinder action. Here, the term “paralysis of analysis” is frequently used. If higher education focused more on effectuation, this could possibly be countered. Sarasvathy strongly argues that the experienced entrepreneur can switch back and forth between the two but will lean toward effectuation. The novice will lean toward a causal approach and only lean toward effectuation if there is a lack of resources. (Sarasvathy 2008)

According to the theory of effectuation, the entrepreneur working with effectuation would ask the questions “Who am I?”, “What do I know?”, “Whom do I know?” in exactly that order. What you know as a botanist/outdoors-man: you are probably very familiar with the burr, and its ability to cling to certain textiles. Through this knowledge, you may be able to create an artificial burr out of nylon, and combine it with a receptive material. In this way, Velcro tape was made and could be used as a zipper with the same qualities, but without the problems of operating it while wearing thick gloves. With the product now in place, the “Whom do I know” question would lead towards the first customer, a possible producer and a strategic partner, which is not essential. What is essential is that the entrepreneur has to use her/his network to further the idea. The network decides the opportunities to explore. Eventually, the full potential of the idea would be exploited, by adding new partners, segments and markets, not necessarily in order of potential earnings but in order of possibilities.

This is exemplified in Figure 4.11, Causal versus Effectuation Approach, which contrasts the causal approach to marketing, based on defining a market and finally resulting in a customer, with the effectuation ap-

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proach, starting with the customer/partner and ending in defining markets.

One last difference which has to be addressed is funding. The classic approach is a build-up model. Here, a goal has to be achieved and the necessary funds are calculated. These funds must be made available, which is the argument for writing the business plan in order to attract money either as investors or loans. With effectuation you start with what you have – and can afford to lose.

The differences between a causal approach and effectuation are not limited to a question of market approach. Sarasvathy (Sarasvathy 2001a) describes it in Figure 4.12, Contrasting Causation and Effectuation (Sarasvathy 2001).

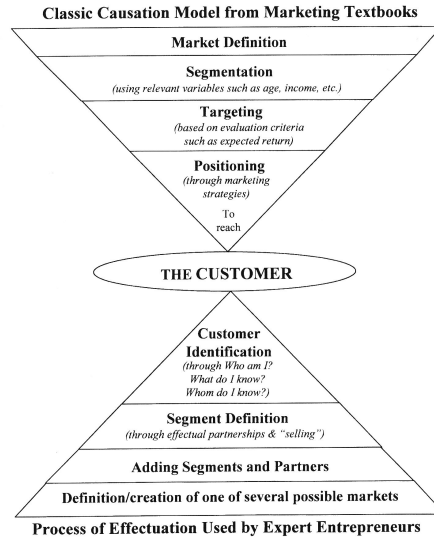


Figure 4.11: Causal versus Effectuation Approach

Contrasting Causation and Effectuation

Categories of Differentiation	Causation Processes	Effectuation Processes
Givens	Effect is given	Only some means or tools are given
Decision-making selection criteria	Help choose between means to achieve the given effect Selection criteria based on expected return Effect dependent: Choice of means is driven by characteristics of the effect the decision maker wants to create and his or her knowledge of possible means	Help choose between possible effects that can be created with given means Selection criteria based on affordable loss or acceptable risk Actor dependent: Given specific means, choice of effect is driven by characteristics of the actor and his or her ability to discover and use contingencies
Competencies employed	Excellent at exploiting knowledge	Excellent at exploiting contingencies
Context of relevance	More ubiquitous in nature More useful in static, linear, and independent environments	More ubiquitous in human action Explicit <i>assumption</i> of dynamic, nonlinear, and ecological environments
Nature of unknowns	Focus on the predictable aspects of an uncertain future	Focus on the controllable aspects of an unpredictable future
Underlying logic	To the extent we can predict future, we can control it	To the extent we can control future, we do not need to predict it
Outcomes	Market share in existent markets through competitive strategies	New markets created through alliances and other cooperative strategies

Figure 4.12: Contrasting Causation and Effectuation (Sarasvathy 2001)

The starting point in effectuation is what you have or can get hold of – and what you can do with it. Sarasvathy compares this to the cook who wants to follow a recipe, and then goes shopping for the ingredients, in contrast to the seasoned home-maker or a mother who in order to feed her family looks through the cupboard in order to find out what she has available and what can be made of it. You might even portray that analogy as the difference between the approach of the chef who wants to build a three-star Michelin restaurant and how the mother of the household creates a meal for the family.

The Michelin restaurateur-to-be knows the effect to be achieved and will want to control all outcomes and try to predict the future, whereas the mother who has to feed her family will start with the knowledge of what means she has available to achieve this.

Fundamentally the differences can be summed up as:

1. Affordable loss rather than expected returns
2. Strategic alliances rather than competitive analyses since strategic alliance makes the competitive analysis unnecessary
3. Exploitation of contingencies rather than exploitation of pre-existing knowledge.
When pre-existing knowledge, such as expertise in a particular new technology forms the source of competitive advantage, causation models might be preferable. Effectuation, however, would be better for exploiting contingencies that arose unexpectedly over time.
4. Controlling an unpredictable future rather than predicting an uncertain one

The basic assumption is that in a causal approach the market exists with or without the new venture, and the task of the entrepreneur is to get as much of it as possible, whereas in the theory of effectuation the market is created by the entrepreneur and the alliances made in the process. This leads to the very simple conclusion “To the extent that we can control the future, we do not need to predict it.” (Sarasvathy 2001a)

During a Ph.D. course with Sarasvathy held by Syddansk University, we visited a museum for design at Trapholt.² During the tour, we came across the Ant Chair designed by Arne Jacobsen, see Figure 4.13, Ant Chair by Republic of Fritz Hansen.

² Trapholt is a museum showing a lot of Danish furniture design. More information can be found at www.trapholt.dk

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As an architect, he put a lot of pride in not only designing the building, but also everything that was placed in it. For Novo Nordisk,³ he designed a new canteen in their new headquarters. True to form, he also designed a chair. Producing a shell for the chair from laminated veneer was a new technique for the Danish furniture industry. With the order for chairs for Novo, he approached a manufacturer and convinced him that in the long run the benefit from the know-how gained by producing this order would outweigh the lack of profit on this particular order.

The design of the building gave him the contingency to pursue yet another design idea, and the order gave him the leverage to have his chair produced. Had he approached the manufacturer with a design, the decision whether to produce or not could easily have been based on a more causal approach as in Figure 4.11, where the segment and market size for a three-legged chair back in 1952 may have been deemed too small, and the chair too futuristic.

But with control of the future, that is the order for chairs for Novo Nordisk, the decision to try was made – and it opened up a whole new corridor of opportunity not only for Arne Jacobsen but not least for Fritz Hansen. The new market was indeed created as an alliance between a customer Novo Nordisk, an architect Arne Jacobsen and a furniture manufacturer Fritz Hansen.⁴

When these strategic alliances were established, it created a whole new brand – Danish Design, much helped by what Drucker calls the unexpected or Sarasvathy calls exploiting contingencies. The latter can also be illustrated



Figure 4.13: Ant Chair by Republic of Fritz Hansen



Figure 4.14: H. J. Wegener - The Chair

³ Danish pharmaceutical company specializing mostly in treatment of diabetes

⁴ Fritz Hansen is a Danish furniture manufacturer who came to produce a long range of Arne Jacobsen designs

through a case of a chair chosen for use in a presidential election debate, see Figure 4.14, which by many is seen as the starting point of substantial Danish furniture export to the U.S.

No one has ever claimed this marketing scoop, so it must be a contingency acted upon rather than a result of a well-planned and efficiently executed business plan. And it was done without paying dearly for product placement.

The result of Sarasvathy's research into expert entrepreneurs and their decision making process showed that they had the ability to switch between a causal and an effectuating approach, but tending towards effectuation. This, in turn, led to the establishment of the following schematic (Figure 4.15):

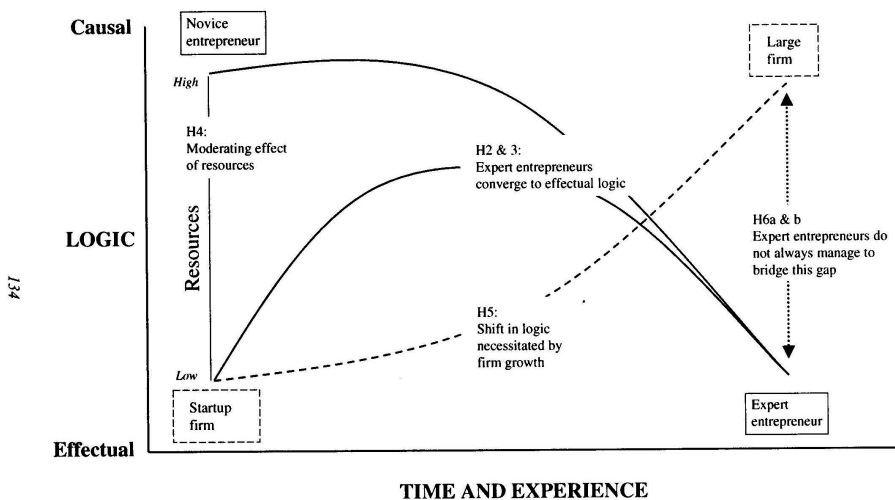


Figure 4.15: Performance implications of causal and effectual logics over the career of the entrepreneur and the life cycle of the firm (Sarasvathy 2008)

The hypotheses shown in the diagram were based on literature review. First of all, the entrepreneur has to be separated from the company, as the company is so to say a learning platform for the entrepreneur. As a start-up with mostly limited funds, the company will be forced to take an effectuating approach. Over time, as it grows, the large firm will tend to impose a causal approach to decision making. Also the novice entrepreneur will lean toward a causal approach but over time and with experience building (perhaps even starting unsuccessful companies) the expert entrepreneur (in Sarasvathy's study very successful entrepreneurs) will lean toward an effectuation-based approach.

These hypotheses (H's in the schematic) naturally lead to the paradox that the successful entrepreneur leans toward an effectuation-based approach whereas a successful large company will tend to make causal decisions. The gap may lead to the departure of the founder once his company grows big.

For the research in this study, a few of the hypotheses raised by Sarasvathy will be addressed, especially the issue of resources and how the moderating effect of resources influences students when they start up companies. In this study, this is accentuated by the dilemma of the case company participating in a business plan competition, Venture Cup, at the same time as they start up the company. The following questions arise: Does the transition from a start-up venture into a large venture lead to a more causal approach in decision making? Is it a challenge for the entrepreneurs to handle the new reality of running a large company?

The causal strategy shown in Figure 4.11, Causal Approach versus Effectuation is a process leading to a need for a certain amount of capital. On the other hand, how does effectuation work? Theoretically, the finances should be based on the principle of the affordable loss and on any strategic partner, customer etc. the entrepreneur can join forces with. One question interesting to address is the type of enterprise to be started. The data for making the model and the associated hypothesis come from expert entrepreneurs as well as literature review. These were not specific to any particular type of company created. Consequently, the same principles might apply to student entrepreneurs from universities starting knowledge- or technology based companies. These companies will have a wide variety of capital needs. On the other hand, what you may expect them to have in common is the founders lack of money, which according to the theory will lead them towards an effectuation strategy. The final step would then be to see to what extent the process of effectuation goes on in large and established companies where the founder is still active.

4.2.8 How entrepreneurs handle risk

In the theory of effectuation, Sarasvathy raises the four questions every entrepreneur has to ask himself: Who am I? Whom do I know? What do I know? How much can I afford to lose? (Sarasvathy 2008) Especially the last question can be interpreted in a multitude of ways. Sarasvathy's intention is to get the emerging entrepreneur past the question of risk, by investing only what he or she can afford to lose, thereby accepting the risk – but limiting it.

There seems to be a direct link from risk to entrepreneurship. This link was established by Ruef and Xu:

“The French economic tradition of Cantillon (1755 [1979]) and Say (1803 [1971]) equates the term ‘entrepreneur’ with an individual who has the motivation and ability to undertake financial risk (see also Marshall, 1890 [1930]). In the tradition of Knight (1921), economic theory has examined the choice made by individuals to become entrepreneurs or employees, emphasizing their attitude toward risk.”(Xu, Ruef 2004)

The question is though, whether willingness and motivation to take risk mean that an entrepreneur is less risk-averse than an average person. Xu and Ruef’s analysis suggests that entrepreneurs are significantly more risk-averse than the general U.S. population. Also, they suggest that the motivation of entrepreneurs to take risk has more to do with non-pecuniary benefits. In order to gain these, they have to take the risk so that they can secure the survival of the venture which holds these benefits. Similar research has been carried out by Sarasvathy, Simon and Lave, where they compared how bankers and entrepreneurs perceived and managed risk. In the study, the expert entrepreneurs and bankers were given problems to solve while talking aloud. The results were as follows:

“Entrepreneurs accept risk as given and focus on controlling outcomes at any given level of risk, they also frame their problem spaces with personal values and consequently assume greater personal responsibility for influencing outcomes. Bankers use target outcomes as reference points and operate by attempting to control risk within the existing structured problem spaces, avoiding situations where they risk higher levels of personal responsibility. “(Sarasvathy, Simon et al. 1998)

In the above, risk is not seen as something the entrepreneur seeks or sees as a benefit. The entrepreneur in this case focuses on controlling the outcome, and takes full responsibility. In a research paper on “The entrepreneurial process in high-tech and knowledge-based sectors in Denmark” (Christensen, Ulhoi et al. 2001) Christensen et al found that:

“This study shows that risk assessment is often considered more important by entrepreneurs in the biotech and life science industries than by IT entrepreneurs. This seems to be partly connected to the significantly higher demand for capital that these kinds of ventures require, and partly to the substantially longer period of time between research, product development, and sale of the final product or service.” (Christensen, Ulhoi et al. 2001)

Again, the entrepreneur is not seeking risk, but the results show that the amount of money needed and the time necessary to market the product seem to affect the perception of risk.

In conclusion, even though there seems to be a general perception of entrepreneurs as risk-takers, research seems to point to the fact that this is not the case. What is notable is the evidence that they may be less willing to take a risk than the average U.S. citizen. Therefore the conclusion must be that risk aversion does not affect the number of start-ups since the US is the country with the highest number of entrepreneurs. The reason for starting a company is certainly not the thrill seeking of financial risk, nor apparently is the potential financial benefit, so the motivation has to be found elsewhere.

4.2.9 Decision making process

In the context of a pre-firm, that is in the phase before a company becomes a reality, the entrepreneur has to make quite a few decisions. The most important one is whether to start a company or not. What is known about the decision-making process in and after the start of the company? In the previous chapter 4.2.8, we saw that the reason for taking risk was not necessarily the desire to make a profit or financial gain. The motivation could come elsewhere. So is the decision-making process influenced by factors other than analysis, facts and logic?

Brunsson (Brunsson 1982) addresses this dilemma saying “A decision is normally described as a conscious choice between at least two alternative actions”.

At its face value, this should lead to a logical choice, that is choosing the best of the alternatives. Nevertheless, Brunsson does not describe it as a rational process. On the contrary, it can indeed be very irrational:

“However, the main problem for organizations is not choice but taking organized actions” (...) “Organizations have two problems in relation to action—to find out what to do and to do it. When confronting difficult actions, organizations separate these problems. Organizations solve the problem of choice by forming ideologies, then the activities preceding specific actions focus on creating motivations and commitments.” (Brunsson 1982) Although what Brunsson describes is the situation in an existing organization, the process is also very much in line with the situation of the entrepreneur. Sarasvathy (Sarasvathy 2008) describes this in the four questions the entrepreneur has to ask her-/himself, in order to decide and to reduce risk and thereby make the commitment, so the entrepreneur’s problem is not only to decide what is correct or possible to do but also to actually do it. That involves motivation and commitment of the organisation and of the entrepreneur or entrepreneurs.

Summarizing from the literature on decision making, the anatomy of a decision involves .

- * a given goal to be achieved or a decision to be made (usually well structured and specific),
- * a set of alternative means or causes (that can be generated through the decision process),
- * constraints on possible means (usually imposed by the environment), and
- * criteria for selecting between the means (usually maximization of expected return in terms of the predetermined goal).

According to Sarasvathy, the above structure pertains to a decision process involving causation. On the other hand, a decision involving effectuation consists of:

- * a given set of means (that usually consists of relatively unalterable characteristics/ circumstances of the decision maker),
- * a set of effects or possible operationalizations of generalized aspirations (mostly generated through the decision process),
- * constraints on (and opportunities for) possible effects (usually imposed by the limited means as well as by the environment and its contingencies), and
- * criteria for selecting between the effects (usually a predetermined level of affordable loss or acceptable risk related to the given means).((Sarasvathy 2001a) 2001)

In her research, Sarasvathy examines the decision-making process of expert entrepreneurs (Sarasvathy 2008), finding that where the inexperienced entrepreneur is causal in the approach to decision making, the experienced entrepreneur can switch back and forth between a causal approach and effectuation as described in chapter 4.2.7. This line of research has been pursued in regard to how novice entrepreneurs, in this case MBA students, handled solving problems in a think-aloud protocol solving the same problems as experienced entrepreneurs. The results are illustrated below:

“MBA students picked target segments based on predictive information given to them and followed textbook procedures in

arriving at decisions on how to capture the target segments. Expert entrepreneurs, however, under-weighted, ignored and even explicitly argued against taking predictions seriously, working instead with things within their control even if that meant effectuating, e.g., changing their initial goals and visions for the venture.”

“That the two groups were different is perhaps not so surprising to most researchers and practitioners in the entrepreneurial community. But that they were almost diametrically opposed and so strongly and starkly opposed was both surprising and important. It turns out, therefore, that not only had expert entrepreneurs gained a pronounced decision-making frame or logic presumably through years and years of entrepreneuring, but the MBA students exhibited an equally well-defined logical frame opposite to that of the experts.” (Dew, Read et al. 2009)

It is of course interesting to see the difference in how the experts and the novices solve the problems. However, the problems they are presented with are all so to say part of the Business School curriculum. Is it then surprising that the students turn to “what they know” in order to solve the question when facing a challenge?

The previously presented studies have been followed by Gustafson in her research on *Entrepreneurial Decision-Making: Individuals, Tasks and Cognitions* (Gustafsson 2004) with focus on a cognitive perspective linking the entrepreneur and the new venture creation with an individual cognitive behavior. Also findings with this angle show the difference between the novice and the expert entrepreneur. Using the same talk-aloud protocol as Dew et al (Dew, Read et al. 2009) the students were asked to solve several problems. Firstly, they were asked to evaluate a technological invention as a business opportunity. The second problem was evaluating the potential of a computer game as a business opportunity. The third problem was buying another company. The fourth and final problem concerned taking a franchise. The amount of data available increased with each subsequent task. All the novice entrepreneurs were students of economy or engineering as well as students from other areas. Gustafson shows a notable difference in the way the three groups solved the problems. She confirms the findings of Dew et al, concluding that: “business students are significantly more prone to analytical decision making regardless of the nature of the task.” It is an interesting conclusion and would be worth noting if it had not been for the nature of the task. Again, it was proven that economy students used what they knew. The other groups had to resort to other tactics since they did not have the classical causal economic education. However, although with

different means, all the students did try to handle the situations where there were no obvious solutions.

What the study made clear is that there is no formula for making decisions, nor is there a formula for achieving action.

4.2.10 Propositions for the role of effectuation processes in business

Sarasvathy sees effectuation as having different roles in different aspects of business:

At the level of economy

Proposition 1: Prefirms or very early-stage firms created through processes of effectuation, if they fail, will fail early and/or at lower levels of investment than those created through processes of causation. Ergo, effectuation processes allow the economy to experiment with more numbers of new ideas at lower costs.

Where Adam Smith (Smith 1966) saw wealth as being created by the function of an invisible hand, while Schumpeter saw the role of the entrepreneur as someone who changed a whole industry through creative destruction (Schumpeter 2008), Sarasvathy sees the possibility in a numbers game. The more ideas an economy can test through the activities of the entrepreneurs, the larger the chance for hitting upon a venture which will change an industry. The argument is that they will fail faster and cost less if they are not viable.

At the Level of the Market or Industry

Proposition 2: Successful early entrants in a new industry are more likely to have used effectuation processes than causation processes. With later entrants, the trend could be reversed.

If the start-up is in a new industry, a causal approach is hindered by the fact that you would have to analyse a non-existing or at best a small and unstructured market. The causal methods and models would not be functional, leaving the entrepreneur to do without them, hence the effectuation approach.

At the Level of the Firm

Proposition 3: Successful firms, in their early stages, are more likely to have focused on forming alliances and partnerships than on other types of competitive strategies, such as sophisticated market research and competitive analyses, long-term planning and forecasting, and formal management practices in recruitment and training of employees.

It would seem that the problem for a venture based on effectuation is whether or not it succeeds in establishing alliances and partnerships. Without them, the new venture is left without orders and capital. Since ventures are based on an affordable loss principle, it is to be expected that the amount of capital available for a typical start-up must be the limiting factor. Thus,

if the company is to survive, the basis for the survival must be found in its ability to attract partners and alliances.

Sarasvathy addresses the function of effectuation for the individual founder or decision maker and makes the following hypotheses:

Within the Firm-At the Level of Founders/Decision Makers

Conjecture 1: In marketing decisions, in contrast to traditional decision makers, effectuators are less likely to use traditional types of market research, such as carefully designed surveys and test marketing; instead, they are likely to dive straight into seat-of-the-pants marketing/ selling activities and alliances.

Conjecture 1 pinpoints the dilemma of a start-up which while participating in a business plan competition (which necessitates the “traditional types of market research” as well as all other kinds of traditional planning) launches its activities before the plan is finished. The question addressed is whether they will rush finishing the plan and follow it, or divert to become effectuators?

Conjecture 2: In financial decisions, in contrast to traditional decision makers, effectuators are less likely to use long-term planning or net present value (NPV) analyses; instead, they are likely to be focused on the short term and, at most, to use informal versions of real options.

Conjecture 2 postulates that novice entrepreneurs favour the causal methods such as NPV, whereas start-ups with limited resources favour effectuation. A student start-up must then be expected to turn towards effectuation, unless they are able to attract sufficient capital e.g. venture capital.

Conjecture 3: In organizational decisions, in contrast to traditional decision makers, effectuators are more likely to build strong participatory cultures, rather than hierarchical, procedures-based ones. In fact, in contrast to traditional decision makers, effectuators are likely to be less effective in running large organizations with well-oiled procedures.

In conjecture 3, Sarasvathy seems to make a distinction between a successful experienced entrepreneur who is capable of switching between effectuation and causation, and traditional decision makers with their ability to continually manage a company based on causation or “well-oiled procedures”. The preference for effectuation seems to be more predominant than the ability to switch between the approaches, leading to the previously mentioned result, where the founder may eventually opt to leave once his successful start-up becomes a large company.

Conjecture 4: Effectuators are more likely to fail more often but are also more likely to manage the failures more effectively and to create larger, more successful firms in the long run (although they may need to hire professional chief operating officers to actually run them!). (Sarasvathy 2001)

As far as entrepreneurs are concerned, a student start-up is often the first start-up of a substantial size. On the other hand, a serial entrepreneur with several start-ups and successful outcomes behind him is likely to have

experienced some failures in the past. Sarasvathy's point about the need to or an actual decision to hire a professional CEO for a student start-up is very interesting, and as such it will be addressed when reviewing the case.

All in all, researching a knowledge- and technology-based company start-up set up by students might expose the process of entrepreneurship as it is undertaken by the student. It would potentially explain effectuation not only as a theory but also as a process. An understanding of what student entrepreneurs go through in establishing and developing their company would open the black box of the process of entrepreneurship and effectuation. This conceptualization of the process could then be compared to the concept of PBL.

4.3 Innovation

A precise definition of the term innovation is hard to find among researchers. Terms *innovation* and *creativity* are often used interchangeably and apparently, they are frequently viewed as synonymous. For the present, I shall regard it as follows: creativity may lead to an invention, whereas innovation is the application and marketing of the invention. This use of the terms is aligned with their application by Schumpeter (Schumpeter 2008) and Encyclopaedia Britannica (Britannica 1973). As regards innovation, it also complies with Den Store Danske Encyklopædi. On the other hand, as stated earlier, academia is not as distinct in its use of the terms.

Both Schumpeter (Schumpeter 2008) and Drucker (Drucker 2007) argue that an entrepreneur has to be innovative. Schumpeter sees the function as creative destruction – destroy the old and create the new. He sets the standard very high since he links innovation with a change within the industry in which it is introduced. On the other hand, Drucker only makes a distinction between being self-employed and being an entrepreneur. Since both entrepreneurs and intrapreneurs (an intrapreneur is a person who sets up new ventures within a company) have innovation in common, the question is if innovation happens by accident or as a result of a decision to innovate. If the latter is the case, is this a discipline which can be learned? According to Drucker (Drucker 2007), innovation is learned as a result of hard and deliberate work. Unfortunately, he suggests no method for being innovative but instead, he lists a number of areas for innovation.

In order to address the question of how to work with innovation or think creatively, several theoreticians have tried to come up with methods for doing so. The attempts to conceptualize innovation have been many, ranging from brainstorming (Osborn 1963) to lateral thinking (De Bono 1990).

The lacking consensus regarding the precise definition of innovation has

prodded many research projects to focus on how to create the most innovative setting. In large organizations, the initial trend has been to specialize research and development in departments for that purpose only. Later research zeroed in on devising how to make companies more innovative, with focus not only on the RD department but also on the whole company. The main question of study has been to single out companies that are successful at innovation. As shown first in the SAPPHO project, (Rothwell et al 1974) and by Rothwell (Rothwell 1992), it is the collaboration and feedback between all departments: design, manufacturing and marketing, which distinguishes the successful company. This cross-departmental and diverse expert background has been the root of corporate organizational changes e.g. the spaghetti organisation in the Danish hearing aid company Octicon, Kolind (Kolind & Paludan-Müller 2006), with the central idea that combining a project organization with a close link between RD on the one hand and Sales and Marketing on the other would put innovative commercial product development on a fast track.

Again and again it has been argued that innovation is not a one-person endeavor, but that it benefits from cooperation within a team, which can be an established entity or a cooperation between groups or individuals with little contact, as described by Sawyer (Sawyer 2006, Sawyer 2003).

Other research programs have looked into the effect of national endeavours to further innovation and thereby safeguard national economic development. In his work *The Competitive Advantage of Nations*, Michael E. Porter (Porter 1990) presents a diamond model of how industries locate opportunities for innovation, and how the process can be furthered. Another example would be Silicon Valley and Route 128 as described by Saxenian (Saxenian 1996). In Denmark this was pursued first by the IKE project at AAU, and subsequently the DISKO project. The latter came up with a shortlist of lessons to be learned. Lundvall (Lundvall, Johnson et al. 2002) proposes that “What matters most is learning to learn and learning organizations”.

In Danish, and apparently also in English, the word innovation has been going through a progressive semantic change. In the Danish Encyclopedia, the definition states that “innovation is the development of a new idea and its realization in practice”. (Lund 1994) The Danish encyclopedia then goes on to mention that “according to Schumpeter innovation is a renewing element, but thus also a destructive element in relation to the existing economic order. Old companies die, new ones rise, behaviour and social life changes.” So innovation is the process of change and the results thereof, as stated in chapter 4.3.1. Therefore it stands in contrast to invention, which does not need to have any impact on society whatsoever.

Invention is the foundation of innovation, but an invention may remain

just that, and never go through the process of innovation and come into use. Examples of futile inventions are not difficult to find, like Apparatus for Facilitating the Birth of a Child by Centrifugal Force⁵ see Figure 4.16, The Blonsky apparatus. One may question if this invention even made it to the proof of concept, but as an invention it has hardly had any impact on society or changed anything, except being an oddity from the patent bureau and as such functioning as a laughing stock.

This chapter does not attempt to clarify how a technology or an invention comes into being and becomes an invention. The intention here is to add to the process of entrepreneurship through illuminating the process of innovation. Innovation has to come from somewhere. Schumpeter states it is the function of the entrepreneur, and the means of effectuating innovation. Bringing an invention into use, the entrepreneur has to handle the process of the pre-firm to build an established firm. In this way, the two terms are intertwined. Although Yeats (Yeats 1962) posed the question “how do you separate the dancer from the dance”, innovation may be viewed as processes which have to be supported by the entrepreneur. Sarasvathy (Sarasvathy 2001b) argues that the entrepreneur has to be separated from the firm, so perhaps the innovation process has to be separated from the entrepreneur too.

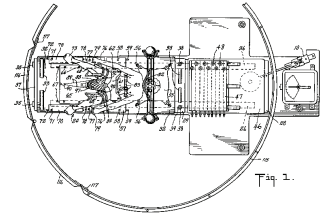


Figure 4.16: The Blonsky apparatus

4.3.1 Innovation as process

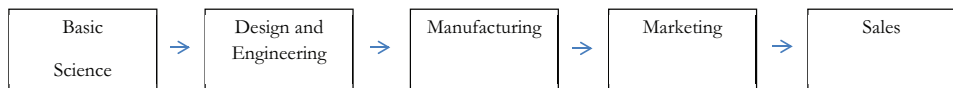


Figure 4.17: Technology Push (First Generation)

The article *Toward the Fifth-Generation Innovation Process* (Rothwell 1994), illustrates the development of the process of innovation, starting out with the period after the 2nd World War. As shown in Figure 4.17, Technology Push (First Generation), at that time the common understanding was that innovation was a sequential process, starting with basic science, where all the inventions and new technology came from. Then, the invention was handed over to design and engineering people, who so to say polished it off

⁵ U.S. Patent 3,216,423 to George B. Blonsky and Charolette E. Blonsky Apparatus for Facilitating the Birth of a Child by Centrifugal Force

so that it could be used, and prepared it for manufacturing. When the goods were there, marketing took over and eventually Sales could start selling the product. The entire process does not invite to any cooperation between the different partners in the corporation. It is as if each one knows exactly what to do without any help at all from anyone else. Innovation happens as a linear progression from basic research to a sellable product. It is assumed that as the product is new, it is desirable. Finally, it should be noted that if basic science is understood as the field within which new inventions/understandings are made, then theoretically this field is outside the innovation process. The model presented by Rothwell was based on the effect of the development of U.S. defence and space projects. The findings went into use in the private sectors, which were also involved in the projects.



Figure 4.18: Market Pull (Second Generation)

Generation two model, shown in Figure 4.18, Market Pull (Second Generation), has another starting point, namely the market and the needs therein. In this way, spotting new business opportunities has moved away from being a function of finding new technologies, advancing science etc. to being a result of knowing what is needed in the market place, and pursuing the possibility. This approach resembles the Marketing Concept as described by Kotler (Kotler & Keller 2006) and stands in contrast to the previous generation of innovation as it does not start with an invention or an exploitation of what is technologically possible, which to some degree resembles the Product Concept, but with what is wanted by the market. This change leads to a repositioning of marketing from being nearly last, to acquiring the utmost strategic importance, since marketing ideally has the knowledge about the market and its needs. So if we look at the process in an organizational setting, the big difference from Generation 1 to generation 2 model is that the top management's focus on research shifts from research to evaluating what needs in the market showed the greatest potential, provided they fit the capabilities of the company. According to Rothwell, the problem with this locus of control is that the company may neglect long term R&D. The company may get stuck in incremental innovation, exposing them to the dangers of radical changes in market or technology.

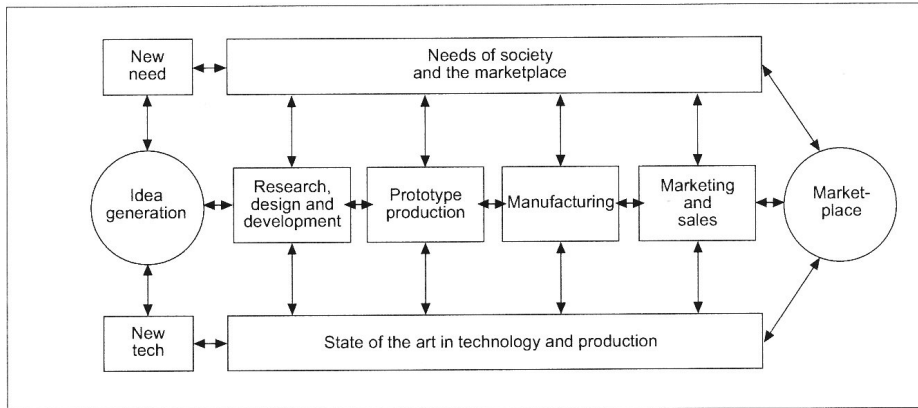


Figure 4.19: The "Coupling Model" of Innovation (Third Generation)

Generation 1 and 2 models were technology- and need driven, respectively. The third generation model of innovation process was based on balancing between the two and was a result of the situation in early 1970s to mid-1980s, where the two oil crises triggered an era of high inflation, where output became larger than demand. Generation 3 model remained sequential.

Figure 4.19, The "Coupling Model" of Innovation (Third Generation,) illustrates the process from idea generation to the market place. Here, the "Needs of society and the marketplace" is one of the balancing points while "State of the art in technology and production" is the other.

"The overall pattern of the innovation process can be thought of as a complex net of communication paths, both intra-organizational and extra-organizational, linking together the various in-house functions and linking the firm to the broader scientific and technological community and to the marketplace. In other words the process of innovation represents the confluence of technological capabilities and market-needs within the framework of the innovating firm (Rothwell & Zegveld, p. 50)." (Rothwell 1994)

As can be seen in the quotation above, this is the first realization that in order to be innovative you need to attract knowledge from networks etc. outside your own company and eventually outside your existing network

Rothwell's research focused on two areas: project execution and corporate level factors. The research showed that the success could not entirely be contributed to one or the other, but rather:

“.....success was rarely associated with performing one or two tasks brilliantly, but with doing most tasks competently and in a balanced and well coordinated manner. At the very heart of the successful innovation process were “key individuals” of high quality and ability; people with entrepreneurial flair and a strong personal commitment to innovation.” (Rothwell 1994)

This statement falls very well in line with the claim made by Doerr (Malone 1997), who says that he would rather have a grade A team with a grade B idea than vice versa. He goes on to say “There’s enormous change underway in every facet of the world. Some is technology driven, some is market driven. All that change creates unprecedented opportunity. But to take full advantage of those opportunities, focus on the team. Teams win.” (Malone 1997)

For Rothwell, the perception of how innovation is balanced between technology, society and market is the same. The focus on the drivers of changes also coincides. However, Doerr specifically wants a team and focuses on the team, which Rothwell calls “key individuals”.

Integrated innovation process is the term used for the Generation 4 model. It was brought about as a result of the competition coming from mainly Japanese companies, which gained competitive advantages by integration and parallel development. This led to a substantial shortening of time to market, and led to a shorter product life-cycle. New product launches were made faster.

“Innovating Japanese companies integrate suppliers into the new product development process at an early stage while at the same time integrating the activities of the different in-house departments involved, who work on the project simultaneously (in parallel) rather than sequentially (in series).”(Rothwell 1994)

As can be seen in Figure 4.20, Example of the Integrated (Fourth Generation) Innovation Process, the parts manufacturer (e.g. Nissan) is integrated into the process, which also means that they are ready to go at the same time as the company, while the company has access to all the knowledge accumulated by the suppliers. But as illustrated, the process is taken care of through meetings representing managers from all branches from Marketing to Manufacturing. The graphic presentation makes it seem as a sequential process with stage gates/coordination. Even though capable of fast output, the process is still not an iterative model in its design.

For the Fifth Generation innovation process, Rothwell evaluated the trends which he saw as being essential for the future (1994) innovation model. He refers to 24 different factors influencing it:

4. Theory

13. Designed-in flexibility.
14. Economy in technology.
15. Close linkages with primary suppliers.
16. Up-to-date component database.
17. Involving leading-edge users in design and development activities.
18. Accessing external know-how.
19. Use of computers for efficient intra-firm communication and data sharing.
20. Use of linked CAD systems along the production filière (supplier, manufacturer, users).
21. Use of fast prototyping techniques.
22. Use of simulation modelling in place of prototypes.
23. Creating technology demonstrators as an input to simulation.
24. Use of expert systems as a design aid.

Seen in retrospect nearly 20 years on, it is to be expected that compared to the previous period, quite a few of the trend “predictions” must have come to be. The main tendency is that a future model will be focused on lean innovation. As seen in Figure 4.21, Product Development Time/Cost Relationship, the assumption is that development cost will go down.

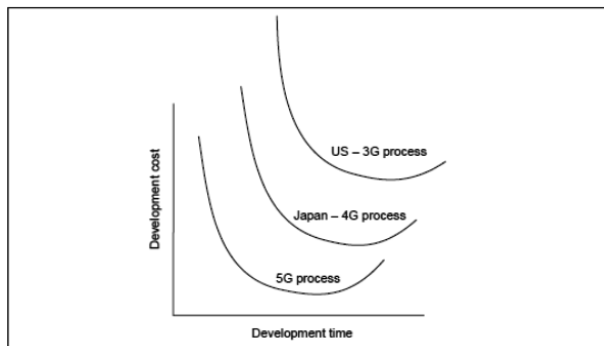


Figure 4.21: Product Development Time/cost Relationship

Rothwell sees this as a consequence of a more integrated innovation process which will represent a further development of generation 3 and 4 with the aid of the aforementioned advances in both organization and technology.

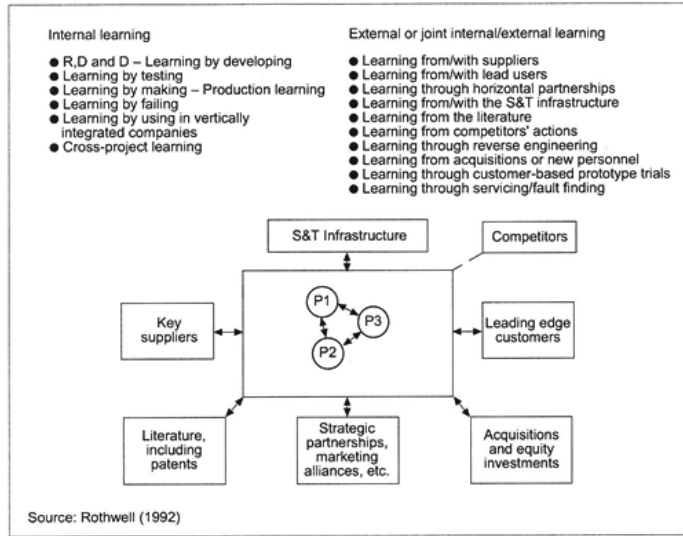


Figure 4.22: Innovation as a Process of Know-how

Rothwell sees this as a consequence of a more integrated innovation process which will represent a further development of Generation 3 and 4 with the aid of the aforementioned advances in both organization and technology.

As the models of innovation process develop, it becomes very evident that they focus on a corporate level, and strive to provide an insight into innovation in going concerns. This can be seen in the model in Figure 4.22, Innovation as a Process of Know-How Accumulation, as Rothwell expected it to materialize.

Literature review reveals that numerous articles on the subject of innovation have been published over the last 20 years. However, a definite search for a Sixth Generation definition of innovation has been less than fruitful. The only one who dares suggest that we may be on route to a sixth generation is Nobelius in *Towards the Sixth Generation of R&D Management* (Nobelius 2004). It is worth mentioning that where Rothwell speaks of innovation, Nobelius speaks of R&D. R&D holds a central position in innovation research, but is not limited to it. The Bluetooth SIG group, consisting of 3Com, Agere, Ericsson, IBM, Intel, Microsoft, Motorola, Nokia and Toshiba, which together engineered the de facto standard for wireless technology, exemplifies the new generation of innovation. These large players agreed to work on a common standard. Furthermore, “the agreement involves, among else, freeing the companies’ own potential patents that may hinder the development of the Bluetooth technology.” (Nobelius 2004) This is one of the first steps toward a far more open and cooperative innovation

process, making it a cooperative initiative rather than an industry fight. Such fights have previously led to customers ending up with obsolete products, and companies with obsolete technology. Achieving an industry standard fast and in cooperation furthers the market acceptance and hence makes the market growth higher. Nobelius sees the future for R&D as a future involving a lot of new technologies to create new products. These technologies will come from a wide variety of sources both inside and outside of the company. “In sum, the sixth generation of R&D management is expected to re-focus the research part, and to enlarge and enhance the capabilities by connecting to loosely tied multi-technology research networks. The pursuit of breakthroughs will take on other organizational approaches and open up for new players in the arena. In short, “chance favors only the prepared mind”.”(Nobelius 2004) So what is predicted is that the Sixth Generation, based on Rothwell’s Fifth Generation, will be a system more open to input and cooperation than before.

Another approach to understanding innovation is based on the works of Lundvall in the DISKO survey, which has been previously referred to in this chapter. In the article *Forms of Knowledge and Modes of Innovation* (Jensen, Johnson et al. 2007) two distinctly different approaches to innovation are discussed and researched in order to find which of these approaches will have the best effect. The approaches are called STI and DUI respectively, where STI stands for Science, Technology and Innovation, whereas DUI stands for Doing, Using and Interacting. These two trains of thought make it necessary to discuss what the term knowledge entails. In science, it is the aim to make knowledge explicit. Knowledge is researched, written down and given to others, thus becoming explicit, but it can only be understood by people having the same type of knowledge “Scientific texts give meaning only to other scientists and manuals may prove useful only to highly skilled workers. This implies that codified knowledge that stands alone is not economically useful.” (Jensen, Johnson et al. 2007) This means that explicit knowledge is not just a question of handing over a recipe. Knowledge transfer is harder than that. The process of learning takes place in different ways depending on what is to be learnt. For example:

- Know-what
- Know-how
- Know-why
- Know-who

Know-what and Know-why are rooted in the STI mode. This knowledge can be acquired from books, by attending classes and researching databases. The other two categories are mostly rooted in DUI, which in turn is rooted in practical experience.

Know-how is typically learnt in apprenticeship relations. The apprentice learns from the master and studies him/her – “Know-how is what characterizes a skilled worker and artisan but it is also something that distinguishes the first-rate from the average manager and scientist” (Jensen, Johnson et al. 2007)

Regarding know-who, Jensen and Johnson characterize it in the following way:

“Know-who is also learnt in social practice and some of it is learnt in specialized education environments. Communities of engineers and experts are kept together by reunions, conferences, professional societies, etc. giving the participant access to discussion of experiences” (Jensen, Johnson et al. 2007)

The STI-mode

The form of knowledge in STI and the way in which innovation comes into being is a consequence of the way learning is achieved. Science is an explicit knowledge which can be transferred to others but

“Further, one of the stylised facts coming out of research on the relation between science and technology is that in most areas the results of scientific research are not directly useful for technological advance.” (Jensen, Johnson et al. 2007)

This raises the problem of transferring the results from pure science to new technology, which may be absent in the innovation process when it originates in science. Looking at the first generation innovation model shown in Figure 4.17, Technology Push (First Generation), where science is the first step in an innovation process, the problem is that the transition from basic science to design and engineering can be tedious and require other skills than those the experts within the know-what and the know-why categories may be able to supply. Technology is to be “understood as involving both a body of practice, manifest in the artefacts and techniques that are produced and used, and a body of understanding, which supports, surrounds and rationalises the former.” (Nelson, 2004)

It would seem that where science is not grounded in a practice it would seem that technology is as it can be defined as “Thus, as Brooks (1994, p. 478) notes, technology should be seen as incorporating generic understanding (know-why) which makes it seem like science. Yet, it is understanding that pertains to particular artefacts and techniques which distinguishes technology from science.” Brooks also says that the relationship between Science and Technology and its interdependency when it comes to contributions from science to technological advances depends on the field within which it

takes part some can do without where as electrical and nuclear technology are deeply dependent on it. (Brooks 1994)

It would seem that where science is not grounded in practice, we can apply the definition given by Brooks: “technology should be seen as incorporating generic understanding (know-why) which makes it seem like science. Yet, it is understanding that pertains to particular artefacts and techniques which distinguishes technology from science.” Brooks also says that the relationship between science and technology and their interdependence when it comes to contributions from science to technological advances depends on the field within which it takes place. Some areas can do without it, whereas electrical and nuclear technology are deeply dependent on it. (Brooks 1994)

The distinction between science and technology is interesting and will need to be kept in mind in the following parts of this study. When applying its findings in order to further entrepreneurship in an educational setting, we shall have to remember how to distinguish between teaching science (know what and why) teaching technology (know how and who). The question how to internationalise this dilemma in a learning perspective will be dealt with later.

Know-how is a skill which must be acquired. Jensen and Johnson (Jensen, Johnson et al. 2007) stress that to create a first-rate scientist or manager, the person has to acquire know-how skills. These are normally learned in apprenticeship relations, which are not very common in science. The question then is where this type knowledge is acquired, as it would seem a difficult topic to teach.

According to Jensen and Johnson,

“Know-who is also learnt in social practice and some of it is learnt in specialized education environments. Communities of engineers and experts are kept together by reunions, conferences, professional societies, etc. giving the participant access to discussion of experiences and information bartering with professional colleagues (Carter, 1989). It also develops in day-to-day dealings with customers, sub-contractors and independent institutes. Relational learning may contribute both to common codes of information and to social bonds of friendship.”(Jensen, Johnson et al. 2007)

When looking at high-tech entrepreneurship, it is interesting to see that the learning environment is such an important part of it. Especially the reference to engineers a group is interesting. In a recent newspaper interview⁶ the “happiness” researcher Christian Bjørnskov, Ph.D. associate professor at

⁶ Politiken, 23 maj 2012, Forsker:”Lykken er fredagsbaren”

Aarhus University, describes the Friday Bar⁷ as a place students find happiness, but he also notes that this network will be important when the student look for work. Since it appears that the network may help find both happiness and a job, universities may have to offer such activities, which not only makes the students happier, but also gives them a place to establish their professional network.

If the transfer of results from science to technology is to be successful, the students must be given the competences which they acquire naturally in the DUI mode. The STI-mode must therefore establish a balance between pure science activities and science-like activities related to technology, acknowledging that science without technology is impossible, though as previously shown, technology can lead to innovation without the input from pure science.

The STI-mode of innovation most obviously refers to the way firms use and further develop the body of science-like understanding in the context of their innovative activities. Over the twentieth century, and still today, a major source of development of this knowledge about artefacts and techniques has been the R&D laboratories of large industrial firms (Mowery & Oxley, 1995; Chandler, 1977). (Jensen, Johnson et al. 2007)

The DUI-mode

The DUI-mode (doing-using-interacting) is practice-oriented. It is what solves problems every day without an academic, scientific, evidence-based approach. Innovation and knowledge are created by trying to do things, using e.g. new technology and interacting with others. This approach does not in any given way assure that we know why it works. We know only that it does. An example of this, though debatable, is the water treatment system installed by Topsøe and Danisco. These high-tech companies, world leaders in their fields, have a system which works but which they could not explain at the time of installation. This paradox exemplifies the situation that pure science can provide tools for problem solving but usually in itself it does not solve practical/real problems. This creates a situation where we operate with a “body of practice” and a “body of understanding”. The understanding may not be able to explain or support the body of practice, even though “virtually all modern technologies are supported by a strong body of science or science-like understanding that illuminates how the artifacts and techniques employed work” (Nelson, 2004). However, Nelson goes on to say “but at the same time, much of practice in most fields remains only partially understood, and much of engineering design practice involves solutions to problems that professional engineers have learned “work”, without any par-

⁷ Friday Bar is a term used for an on or of Campus bar where students meet Friday afternoon to relax and have drink. It is a term well-rooted in Danish student culture.

ticularly sophisticated understanding of why.” (Nelson 2004) Consequently, in order to function in a work setting, we need to have an explicit knowledge taught to us, and a tacit knowledge acquired through a multitude of venues. Without both of them, there would seem to be little chance for success.

In order to work, DUI also needs interaction between people and/or departments. The development of links between the actors actual and potential in the innovation process needs to be built and furthered. (Rothwell, 1977). According to Jensen and Johnson, “the DUI-mode can be intentionally fostered by building structures and relationships which enhance and utilize learning by doing, using and interacting. In particular, organizational practices such as project teams, problem-solving groups, and job and task rotation, which promote learning and knowledge exchange, can contribute positively to innovative performance (Laursen and Foss, 2003; Lorenz et al., 2004; Lorenz and Valeyre, 2006; Lundvall and Nielsen, 1999; Michie and Sheehan, 1999” (Jensen, Johnson et al. 2007). Put this way, the statement refers mostly to larger corporations, but in a start-up what is to be looked for is the team’s capability of showing this behavior inside and outside the group. While working with innovation it must be clear that science and technology may very well be interdependent but they still remain distinct from each other. “Thus, science, technology, and innovation each represent a successively larger universe of activities which are highly interdependent, yet nevertheless distinct from each other. Even success in technology by itself, let alone science, provides an insufficient basis for success in the whole process of technological innovation. In fact, the relation between science and technology is better thought of in terms of two parallel streams of cumulative knowledge, which have many interdependencies and cross relations, but whose internal connections are much stronger than their cross connections. The metaphor I like to use is two strands of DNA which can exist independently, but but cannot be truly functional until they are paired.” (Brooks 1994) It is therefore interesting to see how the two can coexist.

An approach to define types of innovation and specify what influences the process is made by Ortt et al (Ortt, van der Duin 2008). The starting point is the following:

1. Type of innovation (e.g., incremental, radical, transformational).
2. Type of organization (e.g., centralized, decentralized, functional, organic).
3. Type of industry (e.g., high-tech, supplier-driven, fast moving consumer goods).
4. Type of country/culture (e.g., egalitarian, authoritative).

As shown above, not only the type of innovation but also the type of organization as well as industry and culture have an effect on innovation.

The progression in innovation models has been shown previously. Rothwell defined the first four generations (Rothwell 1994), while others took up Rothwell's challenge of finding a fifth generation. The 5th or the 6th generation has not been found, though suggestions have been made (Nobelius 2004). In the article *Innovating the Innovation Process*, Berkhout and Hartmann (Berkhout, Hartmann et al. 2006) start with the criteria which were the foundation of the fourth generation model:

“This rethinking is at the basis of fourth-generation innovation models (Niosi, 1999; Chesbrough, 2003; Christensen and Raynor, 2003). Fourth-generation innovation models can be characterised by the following properties:

1. Innovation is embedded in partnerships: ‘open innovation’.
2. Attention is given to an early interaction between science and business.
3. Hard knowledge of emerging technologies is complemented by soft knowledge of emerging markets.
4. The need for new organisational concepts is acknowledged by emphasising skills for managing networks with specialised suppliers as well as early users.
5. Entrepreneurship plays a central role.” (Berkhout, Hartmann et al. 2006)

In describing how this affects the new model, Berkhout and Hartmann start out with three areas: Scientific Exploration, Technological Research and Product Development. As described on this level, the model is driven by scientific exploration giving new insights into technical processes, which in turn interact with new requirements from the process-product combinations.

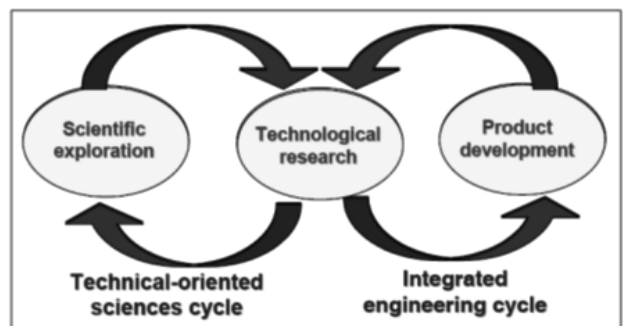


Figure 4.23 “The dynamics surrounding technological research

Figure 4.23: Technological research interact with science and product development

– changes in demand and supply of new methods and tools – are driven by the cyclical interaction between new scientific insights into technical processes (left-hand side) and new functional requirements for process-product combinations (right-hand side).” (Berkhout, Hartmann et al. 2006)

Figure 4.24 The dynamics around market transitions (changes in demand for and supply of According to Figure 4.28, “The Dynamics Around Market Transitions (changes in demand for and supply of sociotechnical solutions) are driven by the cyclical interaction between new scientific insights in processes (left-hand side) and new investments in product-service combinations (right-hand side).” (Berkhout, Hartmann et al. 2006) solutions) are driven by the cyclical interaction between new scientific insights in socioeconomic processes (left hand side) and new investments in product-service combinations (right-hand side).” By comparing the two models the authors conclude

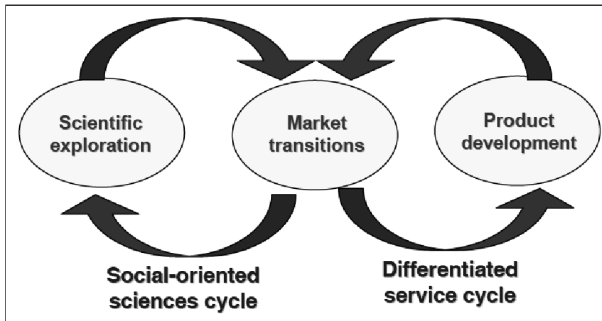


Figure 4.24: Market interact with scientific exploration and product development

that science has both a hard and a soft aspect. Equally, product development has both a technical but also a social aspect. This led them to conclude that

“The result is a systems view of the cyclical change processes – and their interactions – as they take place in a successful innovation arena: hard and soft sciences as well as engineering and commercialization are brought together in a cohesive system of creative processes. Entrepreneurship plays a central role: without entrepreneurship there is no innovation.”(Berkhout, Hartmann et al. 2006)

Figure 4.25 “System model showing the fundamentals of the innovation economy, a circle of mutually influencing dynamic processes: the Circle of Change. In the model, changes in science (left) and industry (right) and

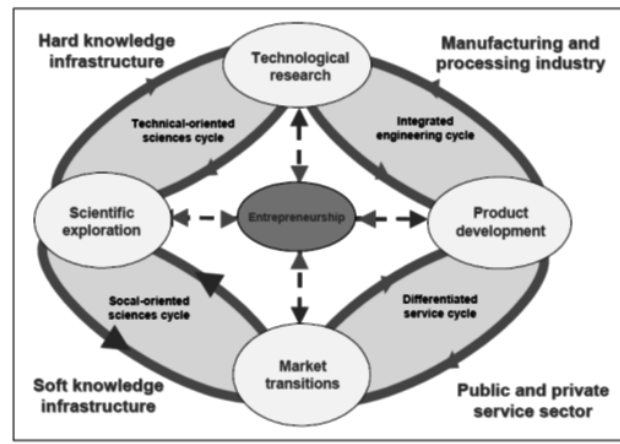


Figure 4.25: Systems model

changes in technology (top) and markets (bottom) are cyclically interconnected. Here, entrepreneurship is given a central role.”(Berkhout, Hartmann et al. 2006)

Not only does this model link innovation with entrepreneurship, but also it gives the entrepreneur the central role in so far as they conclude that without the entrepreneur there would be no innovation. Even though they refer to the model as a model of an innovative economy, that is a macro level, what they have combined is both the explicit knowledge of science in STI mode with the tacit knowledge more connected with a know-how present in DUI mode while keeping the system going only because of the entrepreneur. As can be seen in the model, there are so to say “two sides to everything” – which opens up the model. In order to work, there has to be an interaction between not only the links which have been previously established, but also between all four “nodes” necessary for innovation. This role of carrying information or combining it is given to the entrepreneur.

This approach is very much in line with the Schumpeterian thought of Creative Destruction, where someone will plot to destroy the existing business by combining “things” in an attempt to create a new order of things.

In order to discuss the level of innovation, the authors then offer the classification in which the nodes are: Scientific Exploration, Technological Research, Product Development and Market Transition.

Their classification of innovation is as follows:

Class 1 innovation is a result of a development in one node, Class 2 innovation happens in two nodes and so forth. Class 5 is the situation where all 4 nodes are in play – as in Class 4, but in this situation they are in play from the outset. “In this top league all cycles of change are linked to each other

in the innovation process, continuously driven by creative entrepreneurship, like playing chess at all levels.” (Berkhout, Hartmann et al. 2006)

Innovation is hence seen not only in the perspective of a sequential process, nor only as an iterative process. Besides involving the the four nodes, it also involves the entrepreneur.(Berkhout, Hartmann et al. 2006). On top of that, in order to understand innovation, we may have to add not only the class of innovation as described by Berkhout et al. but also the type, the organization, the industry and the culture as described by Ort.

4.4 Learning

The term learning is often understood as a process that involves much planning by someone teaching someone else, who in return has to make serious efforts to learn exactly what the person teaching is expecting them to learn. The fantastic thing is that the person teaching has the tools to test if what was taught was also learned and vice versa. This very school-like approach has an equivalent in apprenticeship training. But both approaches are based on the assumption that what needs to be learned is well known. However, what if what needs to be learned is unknown? Then, only the process of getting to the desired solution, or the process of making improvements, can teach us what we need to know, or rather only the completion of that process can make us learn what we needed to have known at the outset.

Let me elaborate with an example. During supervision for this study, my supervisor and I got sidetracked by a talk about how impossible it would be to do our jobs as educators if all we knew was what we had known when we left university. On the trip back to Zealand from Aalborg, I got to think about my father. He had trained as a cigar maker when he was just a boy. When his father died he had taken over the job and later moved to work for C. W. Obel in Aalborg. In 1966, he became the manager of operations with a total staff of 2,400 employees. Surprisingly, when he retired 16 years later, there were only 800 employees, but the output of cigars was higher. A few years before he retired, a consultancy company, which was used by the company my father worked for, wanted him to join them, but as my father said what would they need a cigar maker for? Make no mistake, he was in no doubt that he was the best qualified for running "his" factory, but he could not see that he had learned skills of a far more generic kind and therefore applicable in other industries. We discussed it, and he did not budge. What he had learned was how to hand-roll a cigar. What he had done was being a vital part of creating a state-of-the-art cigar-manufacturing plant. He believed that although the job was fun, interesting, challenging and intriguing, it was only a means to produce what he knew a lot about,

namely cigars. Moving forward to the present time: today, we have things like real competence assessment for people who learn that way. In a similar manner, we acknowledge that learning does take place when doing things we do not know how to. Still, how can we understand the process? How can we learn how to create a frame within which we facilitate and support this type learning?

After literature review in fields such as learning + organization, learning + research and development, etc. learning as a goal in itself seems to be limited to a school/academic setting.

In an introduction to his book *The Fifth Discipline* (Senge 2006), Peter Senge writes about the learning organization: *“during my meditation that morning, I suddenly became aware that “the learning organization” would likely become a new management fad. Having watched similar fads (such as creating shared visions) develop in the past, I knew that the work being done, at MIT, Innovation Associates, and by colleague, elsewhere represented a unique perspective and body of practical knowledge that could contribute to organizational learning. I also realized that if we were to influence the fad, we needed to “put a stake in the ground” –to establish a position concerning what was possible, a position that would become a point of reference as the fad cycle developed.”* For a few years, this was indeed the thing that every organization had to be. My literature review shows, though, that the whole concept of a learning organization was a fad and seems to have died by now.

Senge enumerates five areas or disciplines which need to be addressed in a learning organization. These are::

1. System Thinking:

- seeing interrelationships rather than linear cause-effect chains, and
- seeing processes of change rather than snapshots

2. Personal Mastery

First of all, personal mastery will serve to continually reinforce the idea that personal growth is truly valued in the organization. Second, to the extent that individuals respond to what is offered, it will provide an “on the job training” that is vital to developing personal mastery in others.

3. Mental Models

This is how we think and act within the company. Some of it we know, some of it is so ingrained that we do not even realize that it is what we do. Mental models are powerful because they affect what we do and in part what we see.

4. Shared Vision

Vision becomes a living force only when people truly believe they can shape their future.

5. Team Learning

Senge notes that within a group of highly motivated and intelligent managers, the individual IQ was nearly twice as high as the collective IQ, which points to the paradox of team learning. Senge goes on to say that team learning is common in many other areas. Sometimes, the team's IQ will collectively exceed the IQ of the individual members. However, in business this situation is not as common as in other fields such as performing arts and science. Is it because companies focus on solving problems or is it because learning cannot be the sole purpose of an organization?

A lot of research has been done in how we learn, and there are a lot of recent studies on how to share knowledge in organizations. A lot of attention has been given to how to manage projects which will involve creation of new knowledge or how to apply it, e.g. R&D work. Learning and the possibility to gain knowledge is even a part of management mantras like employability (Hillage, Pollard 1999), where the workers ability to get and keep a job is evaluated as employability. Hence, the concept becomes attractive to the employee. So knowledge and keeping knowledge up-to-date, aka learning, is still on the agenda.

4.5 Creativity

In the Danish media, the understanding of creativity and innovation involves an interrelation, as it rightly should. But when reading the articles⁸, it is obvious that the terms creativity and innovation do not only support each other, but they also seem to be used interchangeably. The problem with this is that when addressing these subjects, you need to start up with a clarification of terms.

It has been previously stated in this study that the process of innovation is preceded by a process of invention. The question is now, how does creativity fit into the picture?

In Figure 4.26, Function of Creativity, creativity is a somewhat fluffy term, apparently neither connected to invention nor innovation. Though the

⁸ a search was made on Boersen.dk - the Danish business newspaper and bt.dk - a Danish tabloid paper which showed no clear definition of the term, but constituted a mish mash in use of invention and innovation

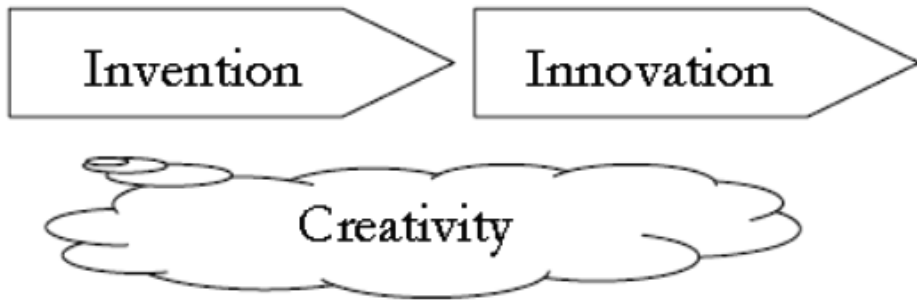


Figure 4.26: Function of Creativity

schematic may not directly imply so, the idea is that the process of invention and innovation is supported by this rather vague entity – creativity. In the following part, the definition of creativity will be explored together with how it interacts with other concepts, primarily innovation.

The business world may have a pragmatic view on how the above question can be answered, and may not require an elaborate theory. It is therefore interesting to see how the term is being used elsewhere. For starters we can consider the educational ministries, that is The Ministry of Children and Education, which is responsible for education except universities. When researching their homepage ⁹, it is clear that creative students of all ages are very much in focus, but the only references to creativity are made within the realm of subjects such as music, visual arts, woodwork and drama. Creativity is not associated with a process but far more viewed as a product. If we turn to the Ministry of Science ¹⁰, Innovation and Higher Education, the approach is fairly much the same, though with a tendency to describe *creativity* as a desired competence. The Danish Council for Strategic Research, which refers to the Ministry of Science, has a Programme Commission on Education and Creativity, whose side unfortunately does not reveal very much about their work. They did not support any activities in 2013 since they did not received any funds. The Danish Ministry of Business and Growth has a “Denmark at Work – Plan for Growth in the Creative Industries and Design” (Erhvervs- og Vækstministeriet 2013), which states that their strategy is calibrated to the following industries: “The creative industries in Denmark delineated here the professions of architecture, books and press, design, film and video content production and computers, arts and crafts, music, fashion, furniture and interior, radio and television and advertising.” The areas of special focus are as follows:

⁹ www.uvm.dk

¹⁰ www.fivu.dk

4. Theory

1. Commercial expertise and access to financing should be strengthened.
2. There must be a faster market maturation of new creative products and design solutions.
3. The growth of the creative industries must be supported by good educational programmes and strong research.
4. Denmark should be an international growth centre for architecture, fashion and design (Danish Ministry of Business and Growth 2013).

As can be seen, though interested in creativity and the creative industry, the ministries establish a clear link between creativity, certain industries and activities such as the aforementioned subjects: music, visual arts, woodwork and drama. Though it must be believed that these “products” result from a process, creativity as a process is not mentioned anywhere. This may seem like a scholastic exercise in semantics, but it is interesting to see that when addressed in the educational system, and in the Ministry of Business and Growth, creativity is not seen as a process of enhancing innovation, but as industries in which innovation may take place. Apparently, a definition of creativity is somewhat hard to come by in a political or governmental arena. Looking at the Danish Encyclopaedia, the definition is as follows:

”creativity (derived from creative, from English. creative, from Lat. creare ’create’), colloquially a loose term for man’s ability to create something new, surprising unprecedented. The word originally used on solutions to problems of scientific and technical in nature, but is now used widely on artistic performance, athletic performance, innovation in economics and business, and even also about lifestyle.”(Lund 2003 - my own translation)

It is interesting to see, that “creativity” was first associated with finding solutions to problems of a scientific or a technical nature, whereas now it seems to have more to do with anything but science and technology. By association, it even developed into a collective term applied to a group of people: “The Creative Class”. Defined by Florida (Florida 2004), the term describes the effect of having a group of highly creative people, characterized as:

“Members of the creative class do a wide variety of work in a wide variety of industries—from technology to entertainment, journalism to finance, high-end manufacturing to the arts. They do not consciously think of themselves as a class. Yet they share a common ethos that values creativity, individuality, difference, and merit.” (Florida 2002)

While so far creativity has seemed to be a function of certain industries, Florida expands the term significantly, and even enlarges the group, stating: “As creativity becomes more valued, the creative class grows.”(Florida

2002). Yet, creativity is still elusive, since it is only a trait of the creative class and desired by its members, but not defined.

“The distinguishing characteristic of the creative class is that its members engage in work whose function is to ”create meaningful new forms.” The super-creative core of this new class includes scientists and engineers, university professors, poets and novelists, artists, entertainers, actors, designers, and architects, as well as the ”thought leadership” of modern society: non-fiction writers, editors, cultural figures, think-tank researchers, analysts, and other opinion-makers. Members of this super-creative core produce new forms or designs that are readily transferable and broadly useful—such as designing a product that can be widely made, sold and used; coming up with a theorem or strategy that can be applied in many cases; or composing music that can be performed again and again” (Florida 2002) Again we are left with creativity as something which produces a result without defining how - and here it is produced by a special class of people. And yet we have no further information as to how to be creative.

Attempts to systematize work on creativity have been made numerous times, ranging from brainstorming, Osborne (Osborn 1963), to TRIZ by Altshuller (Altshuller 1999) in the Soviet Union, who tried to come up with a system of how to solve complex problems, to lateral thinking proposed by De Bono (De Bono 1990). Also, the attempts to conceptualize creativity have been many. But a definite answer to the question how to be creative has not been reached.

The origin of creativity can be traced back to ancient times, as shown by Kozbelt et al (Kaufman, Sternberg 2010) and Byrge in *Conceptualisation of Creative Practices Through Action Research* (Byrge). In addition, several attempts have been made to create a basis for giving students competences in creativity and innovation, as described by Hansen and Byrge (Hansen, Byrge), but none has come up with a method.

In their work on Creativity Theories, in the Cambridge Handbook of Creativity (Kaufman & Sternberg 2010), Kozbelt, Beghetto, and Runco outline what their literature review revealed as a system to organize trends in creativity research. The problems in classifying literature research are simply due to the diversity of subjects: “This variation is partly due to the richness of the topic itself which encompasses the subjective experience of the moment of a private, minor insight by an ordinary individual as well as the greatest achievements of human genius throughout our history - what might be called ”the mind’s best work” (Perkins, 1981).”(Kaufman & Sternberg 2010). The dilemma of handling creativity is shown in the discussion of how to organize the magnitude of creativity. The so to say minds best work is defined as the Big C , the highest order for creativity. One concept would then be to describe everyone else as little c. Using art as an example determining the

Big C would be relatively easy. However, measuring everyone else at the same level of creativity misses the point. This is because the classifications made involve both Pro C, who is a trained painter and actors such as Little C, an interested amateur and Mini C, who is the school child who paints in arts and crafts classes. You could argue that Bell's Laboratories as well as Edison's companies each only had one Bell and one Edison, exemplifying the Big C's. At the same time, within their corporations they had lots of Pro C's helping them develop their ideas. The Little C could be a DIY, and the MiniC would be kids playing with old parts trying to make them work.

In addition to the problems with defining the magnitude of creativity, there are a number of areas within which the term creativity is used. It is frequently employed in the following categories of research: Developmental, Psychometric, Economic, Stage and Componential Process, Cognitive, Problem Solving and Expertise-Based, Problem Finding, Evolutionary, Typological, and Systems.

“Besides the previous comparative elements*), theoretical approaches to creativity may also be considered in terms of which aspect or facet of creativity they emphasize (Rhodes, 1961; Runco, 2004b). Traditionally, these aspects have been referred to as the “four P's of creativity”: process, product, person (or personality), and place (or press). More recent versions of this framework (e.g., Runco, 2007a) have extended it to six P's, adding persuasion (Simonton, 1990) and potential (Runco, 2003)”(Kaufman & Sternberg 2010) *) Together, they constitute the “sizes” of creativity in the 10 categories of research mentioned above.

1. **Process.** Process is understood as “Theories that focus on the creative process aim to understand the nature of the mental mechanisms that occur when a person is engaged in creative thinking or creative activity.” If this could be qualified, we would then have methodology for being creative. But the research presented does not arrive at a final solution for how to handle a process of creativity, several areas of which are left to be understood.
2. **Product.** Product is defined as “works of art, inventions, publications, musical compositions, and so on.” When using products as a starting point, we cannot say anything about the process. Instead, we can only detect creative individuals.

Similarly to entrepreneurship research, the research into person or personality was done in order to describe the uniqueness of the creative person. It resulted in claims that a creative person's traits comprise intrinsic motivation, wide interests, openness to experience, and autonomy. Nonetheless, later research would show that “Personality is

now usually viewed as one influence on creative behaviour, rather than a complete explanation (Feist & Barron, 2003).” (Kaufman & Sternberg 2010)

3. **Place.** “The research on places or ”press” factors (press from environment) is especially useful in defining such interactions between persons and environments. There are individual differences in terms of preferred environments, but again also general tendencies: Creativity tends to flourish when there are opportunities for exploration and independent work, and when originality is supported and valued (Amabile, 1990; Witt & Boerkem, 1989)” (Kaufman & Sternberg 2010)
4. **Persuasion.** In order to be seen and recognized as creative, an individual needs to be acknowledged, and in order to be so, they need the ability to make other people change their perception and see the point or idea of the creative person.
5. **Potential.** According to Runco, the purpose of introducing potential as a 6th P is to address creativity in a way which allows “research on everyday creativity and the creative potentials of children and others who may have most of what it takes but require educational opportunities or other support before they can perform in a creative fashion.”(Kaufman & Sternberg 2010) This hierarchy is shown in Figure 4.27. The aim is to support the development of the potential but not yet realized creativity through addressing the need for research in the field.

“This hierarchical framework captures the earlier alliterative scheme but allows research on everyday creativity and the creative potentials of children and others who may have most of what it takes but require educational opportunities or other support before they can perform in a creative fashion. (Runco 2008)” (Kaufman & Sternberg 2010)

There have been further investigations into creativity. A literature review on the topic brings forth a lot of articles that provide a metaanalysis as well as further literature reviews of the subject. For example see the discussion of scientific and artistic creativity (Feist 1998), Determinants of organisational creativity: a literature review (Andriopoulos 2001), The Effectiveness of Creativity Training: A Quantitative Review (Scott, Leritz et al. 2004), Organizational Culture’s Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development (McLean 2005), Understanding the relationship between mood and creativity: A meta-analysis (Davis 2009, ROSE, LIN 1984), A Meta-Analysis

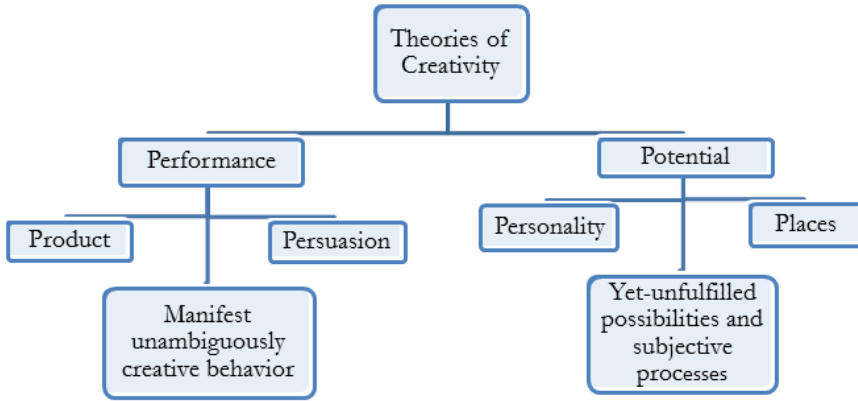


Figure 4.27: (Runco 2008)

of Long-Term Creativity Training Programs (ROSE, LIN 1984). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus? (Baas, De Dreu et al. 2008).

As can be judged from the titles of these meta analyses and literature reviews, the search for a definite understanding of what creativity is and how it plays out for individuals and organisations is still under way. As for an understanding of what happens when dealing with creativity, Kozbelt, Begheuo, and Runco start their work on theories of creativity with this insight: "For example, creative ideas often result from divergent thinking, but too much divergence leads to irrelevant ideas that are not creative in the sense of being both original and useful. Moderation also plays a role in the tactic usually summarized as "shift your perspective," which can contribute to original insights. Changes in perspective can be useful, but not if they are so extreme that ideas and solutions have no connection to the problem at hand." (Kaufman & Sternberg 2010)

As to a definition of creativity, it is still as elusive as it was in a Ford and Harris article The elusive definition of creativity. (Ford & Harris 1992)

All in all, creativity is hard to define, although it seems to be associated with arts, creative class, etc. Maybe that is why engineers, who per definition solve "real" problems, do not see themselves as being part of it.



Figure 4.28: Dilbert by gracious permission from UNIVERSAL CLICK

4.6 Actor Network Theory

As the chapters on theory demonstrate, the roots of successful entrepreneurship may have to be found in areas other than the common explanations, for instance that entrepreneurs have a special gene or that it was pure luck, the right place, the right time, etc. It is clear that unravelling entrepreneurship requires much complex mechanisms. It must involve factors in and around the entrepreneurs, not to mention the researcher. A theory that can deal with this complexity is actor network theory, which will be introduced in the following.

Michel Callon and Bruno Latour are interested in technology research and researchers of technology. When viewing technology and its development, Latour (Latour 1991) addresses the position of the development of technology within the firm and the meaning of technology in society. They illustrate the idea through several stories. The interpretation of each story is different depending on the angle you view technology from. In one story, they mention how a problem is solved when hotel guests lose their room keys instead of leaving them at the desk. We also find out how Kodak came to be, and why the technology creates the user, how Pasteur voiced his wish to acquire funds to study the production of wine, or rather its improvement, which would help selling French wine, or maybe more accurately serve his interest in fermentation.

These diverse cases are used to enhance an understanding of the complexity in the process of innovation. However, the meaning of each story is determined by who tells it and what viewpoint the person represents. This leads to a situation where the story told depends on the actor telling it, which is not surprising or new. Nor is it unexpected that there is a relationship between the human actors. But the cases raise the question of a non-human actor. In the story that involves a hotel key, the hotel manager has a relation to the key in terms of its function, its value, and the security it offers for the guest, or lack of it, if it is lost. A key is not just a key - it takes on a lot

of functions. The non-human actor, also called the Actant, can hence play a vital role in innovation processes. It can drive the process, even though the actant cannot by itself be an actor. Its very being gives meaning and relationship to the actors in the process. The problem was illustrated in the article by Callon (Callon 1985) about the scallop in St Brieuc Bay, and the researchers attempt to find out how to help the scallop repopulate the bay. The scallop cannot be considered an actor but is the central point around which all activity is centred. The scallops among themselves are acting as scallops do, in this case dying out due to over-harvesting, but they cannot influence it. They only continue the life-cycle they have. So even though they do have a life cycle normal for a scallop, and this life cycle is of the essence for researchers who try to help sustain growth in the population of scallops, and furthermore the scallops and their survival in the bay are essential to the fishermen, the scallops cannot actively act. They are not actors but are as much part of the project as the researchers and the fishermen are. Therefore, Callon (Callon 1985) argues for a generalized symmetry in which the actant is as important as the actor.

“We thus have to do more than follow the sequence of events surrounding an innovation: *should compare the different versions* given by *successive* informants of the ‘same’ syntagm. We do not have an outside referee to test the credibility of a claim. The degree of alignment or dispersion of the accounts will be enough to evaluate the reality of a claim.”(Latour 1991)

So not only do we have to follow the sequence of what happens, but we need the story told by as many actors as possible. Furthermore, we need to understand that beside the actors there will be certain actants, not mentioned in the quotation above, which have an influence on why and how the network is interacting.

In his article, Latour (Latour 1991) describes the development of the Kodak camera, based on purely technological strides forward and combinations of these steps. This, of course, leads to listing technological advances which are not directly interrelated, but are connected through people who understand them. Secondly, when we look back at a history of a new product, we can see that technologies would be enhanced if linked. Though, only human actions e.g. the purchase of a patent, a cooperation agreement or, in this case, the research left by Eastman show that there is a connection. This leads to the question of form or content. Latour states that “The analyst should never predetermine the weight of what counts and what does not, of what is rhetoric and what is essential, of what depends on Cleopatra’s nose and what resists all contingencies. The weight of these factors must be calcu-

lated as a function of the movement of syntagms and they will be different in each story.” (Latour 1991)

In the case of the camera as a product moving from a professional to an amateur market, it should be remembered that it is not only a question of a technical content of the product, but also of a social context “The new amateurs and Eastman’s camera co-produced each other. We see neither resistance to, nor opening of, nor acceptance of, nor refusal of technical progress. Instead we see millions of people, held by an innovation that they themselves hold.” (Latour 1991). In order to research innovation, Latour says it is possible to have both society and technology changing over the course of the innovation: “the unity of an innovation is not given by something which would remain constant over time, but by the moving translation of what we call, with Serre a quasi-object (Serres 1987)” (Latour 1991) The terms quasi-object and token are used alternately, but can be understood as a network or a system which is a central point which everyone involved finds worthwhile building and defending. If parts of this alliance break down or participants stop finding it worthwhile, the quasi-object or token will break down. These networks can be extremely complex, but known as to input and output. The complex processes taking place together with their participants make up the black-box. This black-box is referred to by Callon (Callon 1991) as punctualization. As long as it is used in the network, it is important to the network, but as long as it works it is not of interest to the network. Take the port of Kobe in Japan. As a port, it is hugely important to Japan as the largest point of import-export, and as such an extremely complicated system. However, for the manufacturers in Japan and the exporters to Japan, it was of absolutely no interest as long as it performed. It was a black-box to and from which a container was delivered. First with the earthquake in 1995 and the temporary breakdown of the system did it gain interest from its network outside the port. A network may have many such points of punctualization in order to function. A veteran car from the thirties may have very few such components (black-boxes), which means that a mechanic would have to repair the car as such, no matter where the system broke down, since for the mechanic the car was more or less one system. Today, for the user a car represents one system (network) but to the mechanic it is a compilation of different black-boxes, most of which the garage can do nothing about, but exchange the part with a new one, a new black-box. As long as the black-box is used and passed along in the network, it is of interest, but if the interest diminishes, so does the importance of the black-box. Eventually, it may even wane and die out. Industries have risen and died in this way. Think of radio tubes, electronic components replaced by integrated circuits or records, cassette tapes, CDs, which today have been replaced by a virtually downloaded product.

In order to research these networks not only the actors and actants who take part in them but also other elements must be examined. There are two types of them. The first of them is Intermediaries. An intermediary “in my vocabulary, is what transports meaning or force without transformation: defining its inputs is enough to define its output.” (Latour 2005) They do nothing to the process, and can be discarded, as they have no influence on what is taking place. Mediators are the second type. “Mediators transform, translate, distort and modify the meaning or the elements they are supposed to carry.” (Latour 2005). Latour uses a computer as an example of the most complex intermediary. It does nothing to change or alter the meaning and is hence uninteresting. Researching the intermediary will bring us no further in understanding the process. Mediators, on the other hand, may take the form of a banal conversation, which may become a terribly complex chain of mediators where passions, opinions, and attitudes bifurcate at every turn. .. As we will slowly discover, it is this constant uncertainty over the intimate nature of entities – are they behaving as intermediaries or as mediators? – that is the source of all the other uncertainties we have decided to follow.” (Latour 2005)

In order to define the network in the case concerning the re-population of scallops, Callon identifies four discernible aspects. “Four ‘moments’ of translation are discerned in the attempts by the researchers to impose themselves and their definition of the situation on the others: (a) problematisation: the researchers sought to become indispensable to other actors in the drama by defining the nature and the problems of the latter and then suggesting that these would be resolved if the actors negotiated the ‘obligatory passage point’ of the researchers’ programme of investigation; (b) interessement: a series of processes by which the researchers sought to lock the other actors into the roles that had been proposed for them in that programme; (c) enrolment: a set of strategies in which the researchers sought to define and interrelate the various roles they had allocated to others; (d) mobilisation: a set of methods used by the researchers to ensure that supposed spokesmen for various relevant collectivities were properly able to represent those collectivities and not betrayed by the latter. In conclusion it is noted that translation is a process, never a completed accomplishment, and it may (as in the empirical case considered) fail.” (Callon 1985)

However, there are a few important discrepancies between the scallop narrative and the case study in this study:

Problematisation: In the article the researchers want to study the breeding process of the scallops and come up with a solution to how to create scallops farms. The researchers are actors on par with other actors and actants in the case. However, in this study, the researcher is not part of the “innovative entrepreneurship venture” but needs to describe and hence gain access

to the network in which the process is situated. Though, the relationship is different, since problematisation must take place in order to get the actors to buy into the necessity of having the entrepreneurial process described. Understood as such this study had to be characterized to the participants as necessary but of no commercial value to them.

Interessement, enrolment and mobilisation take on different aspects when applied to a start-up based on a new technology than when used to analyse an old industry which is introduced to a new “technique”. But when dealing with the case, some of the networks may act as if they are trying to lock other actors into certain systems and hence roles. For now, just a short reference to the way Venture Cup wants to handle the process of creating entrepreneurs out of students. The way Venture Cup acts is very much in line with both problematisation, interessement, enrolment and mobilisation as defined by Callon (Callon 1985).

When using ANT (Actor Network Theory) to analyse a narrative, we need to be very careful about viewing the narrative as either realistic or unrealistic. The adjectives we use about different stages or ideas are in no way making them less important for the ANT and thereby for understanding the innovation. What we are trying to describe is the progressive construction of the reality. In order to do so, we have to look at the ANT in every aspect necessary, that is both local and global as well as temporal. If we can follow the process while it takes place, which we can in the case study analysed in this study, as researchers we may face the problem of having to be in multiple places at the same time in order to observe and collect empirical data. In *Science in Action* Latour claims that “We study science in action not ready made science or technology; we either arrive before the facts and machines are black-boxed or we follow the controversies that reopen them.” (Latour 1987) This problem of either coming before or coming late is addressed in *Shadowing* by Barbara Czarniawska (Czarniawska-Joerges 2007), where she discusses the time perspective as well as the place. If we have to follow a case study from the perspective of arriving before the case becomes one, we will not know if the case will produce the information we look for. Therefore, we tend to arrive late and hence open the black-box. Czarniawska takes the position that you may have the desire to describe things as they really are, but when you make interviews, these interviews do not tell the story as it really happened, but tend to tell the story as the actor now wants to present it. (Czarniawska-Joerges 2007) Even though this may be the case, Czarniawska argues that it would be presumptuous to think that the informant from the organisation you are working with would plan to come up with another narrative or explanation in order to achieve a different picture, and it would most probably be contradicted in the next interview.

This leads to a need for a dialogue about the topic of the research and

the informants being knowledgeable about what happened in order to get a conceptualisation of the process which took place. This dialogue must be authentic, which means that the observer/researcher cannot ask questions to prove oneself right (Henriksen, Norreklit et al. 2004). The problem is that the answer is so to say limited by the boundaries of the question. “In sum, dialogue in the conceptualising method is a conversation conducted by the logic of question and answer. The true question is characterised by its authentic nature and its openness. The purpose of openness is to reveal the inner logic of the subject matter and this openness is only possible if the people engaged in the dialogue use such openness to search for the logic of the subject matter.” (Henriksen, Norreklit et al. 2004)

Therefore trust and openness are the key to a useable ANT narrative. If they are present, the narrative will be useful in a process of conceptualization.

4.7 Team

4.7.1 Introduction

This chapter will deal with team and team theory. The reason is that when dealing with high-tech innovation and entrepreneurship it would be wrong not to acknowledge that in order to achieve innovation within this field you will most likely have to involve more than one person. All too often, there is a tendency to ascribe inventions to one person. If you search for inventors of radio and telephones, the only person named as the inventor is usually Alexander Graham Bell – also known as the founder of Bell Laboratories, which in fact were founded with the money awarded to Bell by the French government for being the inventor of the telephone. Strictly speaking, Bell could not have done that if it were not for the input from a wide range of other people whose contributions made it possible. At first, Bell had the idea but not the capability to develop it. This was not achieved until he got financing in place to hire the necessary specialists. Since then, technology has grown in complexity. The case study chosen for this paper and the setup of Venture Cup make it necessary to look theoretically at how groups or teams of students work together in the pre-firm – pre-product phase of the entrepreneurial and innovative process.

First the concept *team*. It is a word used quite freely. In Denmark, it has been introduced from English with the same lack of precision which it had in the original use. In English the word team, used to refer to animals or groups of animals harnessed to pull. Only later did it refer to people, first as one group (a team) opposing another group in sport or a crew and a gang. A gang can mean people working together doing the same job. A crew are people solving the same task e.g., flying an aircraft or sailing a boat. (En-

cyclopedia Britannica on line) In Danish you will have words holding very much the same connotations. As a buzzword team has been used in many connections, which is what warrants a closer look at how to operationalise its use – since it is used both as an entrepreneurial team, founding team innovation/innovative team etc. The purpose is therefore to give meaning to the term and not just use it as a buzzword.

As was pointed out in the chapter on innovation, in order for an innovation to work it has to involve an organizational change. It is therefore not surprising that the term team as a management tool originates from there. The question of how to create an effective group has already been worked on for years, e.g. the work of Bruce W. Tuckman (Tuckman 1965), who looked into how a small group became efficient. In his article, the focus was on the creation of efficient therapy groups. He came up with a process later adapted into a management theory of forming, storming, norming and performing (Tuckman 1965). Only later did changes in business bring about the need for understanding small groups/teams. In his article *The Coming of the New Organization*, P. Drucker (Drucker, Harvard University. Harvard Business Review 1988) points out that the development of a new type of company predominantly occupied by experts accounts for the need for a new type of organization. He uses the analogy of a large symphony orchestra with more than a 100 specialist/musicians, who for all practicality when rehearsing or performing are led by a conductor and a first violinist, which is a management group of two. Now consider how big a management and middle management group you would have in a traditional company with experts of various specializations. But because each specialist knows the task at hand, which in a symphony orchestra is the music to be played, and his or her task in accomplishing it, which is to follow the notes transcribed for each instrument, the need for a traditional hierarchical management system is no longer there. This is why the system has to be replaced by a new type of organization, in which information and the flow of information between the employees is far more important than having managers managing the experts. Drucker notes that in his view it is interesting that the new organization will resemble the organization of the last century (19th century) in that it will be a very flat organization with very few levels. In the organization of yesteryear knowledge was concentrated at the top, and the remaining levels were merely helpers. In contrast, in the new organization the specialists will possess the expertise in solving the task at hand, but they will need very little management. They will be self-managed in task-focused teams. Just as a conductor, who can in no way coach and explain things to the players of the different instruments, neither can nor should the manager. The manager's task resembles the overall role of the conductor. It is to solve the task and get the best from each individual player/specialist. (Drucker, Harvard Uni-

versity. Harvard Business Review 1988) When dealing with specialists, there is a need for another type of organization. The question must therefore be what constitutes a team, how teams are created and what they are based in.

4.7.2 How to conceptualise a team

In order for an information-based organization to function it will“ .. require clear, simple, common objectives that translate into particular actions. At the same time however, as these examples indicate, information-based organizations also need concentration on one objective, at most on a few” (Drucker, Harvard University. Harvard Business Review 1988). Though, this still does not say much about team. It says more about the overall strategical focus of the company. In 1993, Katzenbach and Smith published the book *The Wisdom of Teams* and the article *The Discipline of Teams*. In the latter, they distinguished teams and groups as illustrated in figure 4.29, The Discipline of Teams.

In the book *The Wisdom of Teams*, Katzenbach et al (Katzenbach, Smith et al. 1993) defines a team:

“A team is a small number of People with **complementary skills** who are committed to a **common purpose, performance goals,** and **approach** for which they hold themselves **mutually accountable.**” (my own boldface)

As can be seen from the definition, the five demands which are underlined are in line with Drucker’s observations, but the limited size of the group has another reason.

Small number.

First of all, what is meant by a small group is a group of between two and twenty-five people. The reason is that a larger group cannot comply with the way a team will have to work. A large group will have difficulties in interacting with one another, and will have problems agreeing on how to proceed. A large group of people will tend to subdivide into sub-teams instead of becoming an actual team itself. Meetings in large groups tend to be considered a chore since people are unsure what the purpose is, so meetings are generally considered a waste of time. Large groups tend to reach their breaking point much faster than a smaller group of people. “For all reasons discussed above, large numbers of people usually cannot develop the common purpose, goals, approach, and mutual accountability of a real team.” (Katzenbach, Smith et al. 1993)

Complementary skills.

For a team to work it must have complementary skills, which are divided into three groups.

Working Group

- Strong, clearly focused leader
- Individual accountability
- The group's purpose is the same as the broader organizational mission
- Individual work products
- Runs efficient meetings
- Measures its effectiveness indirectly by its influence on others (such as financial performance of the business)
- Discusses, decides, and delegates

Team

- Shared leadership roles
- Individual and mutual accountability
- Specific team purpose that the team itself delivers
- Collective work products
- Encourages open-ended discussion and active problem-solving meetings
- Measures performance directly by assessing collective work products
- Discusses, decides, and does real work together (Katzenbach 1993)

Figure 4.29: The Dicipline of Teams

- A. Technical or functional expertise
- B. Problem-solving and decision-making skills
- C. Interpersonal skills

What Katzenbach and Smith found was that at the start, none of the teams they researched had the necessary skills. Some skills had to be learned while others had to be brought into the group. Another approach to these skills shows in the function and roles of the Belbin typology test. (Belbin & Jay 1981), where group members are tested and defined as predominantly belonging to one of nine roles, as diverse as specialist and implementers.

Committed to a common purpose and performance goals.

“Teams develop direction, momentum, and commitment by working to shape a meaningful purpose. Building ownership and commitment to team: purpose, however, is not incompatible with taking initial direction from outside the team he often asserted assumption that a team cannot ”own” its purpose unless management keeps completely away from the team actually confuses more potential teams than it helps. In fact, it is the exceptional case – for example, entrepreneurial situations – when a team actually creates a purpose entirely on its own.” (Katzenbach, Smith et al. 1993)

In a small founding team the question is if you can see the founders – as management, as they are so much involved in the actual execution of the purpose and am so much dependent on the performance of the team that you may be able to separate the Owner/manager from the team. They seem to be so interlinked with the team that an attempt to separate the functions may not even have a purpose, but it is important to notice, that when the owners are so much part of the team, the decision processes are made in the team if not by the team.

Performance goals consist of:

A. a *team-work-product* “which must require roughly equivalent contributions from all the people on the team to make something specific happen that, m and of itself, adds real value to company results.”(Katzenbach, Smith et al. 1993) In a start-up, it is not a problem that everyone has to contribute the same, in so far as the founders understand the difference between themselves and the team members who are not owners but are paid for their work.

B. “the *specificity of the performance objectives* facilitates clear communications and constructive conflict within the team.” When the performance goals are clear, the team can discuss how to solve or change the problem. There is no need to discuss the objective

C. the objectives must be *attainable*. The question is then how to decide that something is attainable. With innovation, it has never been done before. There is a learning curve for everything. However, for a first-time ever attempt, how is it possible to decide that the goal is attainable?

One of the most prominent goals ever made was the Kennedy space goal, first formulated to Congress 25th of May 1961 and reconfirmed in the famous speech “We Choose the Moon” from September 1961 (see Figure 4.30).

Kennedy addresses *team-work-product* and *specificity of the performance objectives*, are quite clear in spite of any doubt about attainability.

D. In the team, an evaluation criterion for contributions by the team’s members is the specific goal to be attained – not their status within the or-

We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

—
John F. Kennedy,
Speech at Rice University, Houston, 12 September 1962

Figure 4.30: “We Choose the Moon”

ganization. Katzenbach et al formulates it in the following way: “When a small group of people challenge themselves ... their respective titles, perks, and other “stripes” fade into the background.” In the organizational setting this would then mean that each member contributes where the effort is the most valuable. It is expected that the task ahead is more important than any ego or the previous management style.

E. Small wins are important. A sense of success not only at the end but all along the project helps build the team spirit and helps overcome larger issues which may have to be tackled in order to achieve the final objective.

Common approach

In order to work as a team, the team’s approach must include an economic, administrative and a social aspect. The latter should be treated as an integrated part of the approach. There are different roles to be played and these roles have to be developed over time.

Mutual accountable.

“No group ever becomes a team until it can hold itself accountable as a team.”(Katzenbach, Smith et al. 1993) This is then the final test which, if fulfilled, constitutes a team. It seems odd that a distinction is made between members of a team in an organization being accountable to their boss or to the team. If you are accountable to the boss, it seems a somewhat individual accountability whereas as a team you are individually accountable for your actions and contributions to other members of the team. The team as such is accountable for achieving the end goal. Earlier Katzenbach et al claimed that it is the extreme case when the team creates its own purpose when dealing with entrepreneurial situations. Here, though, the team is mutually accountable, with some more accountable than others. The members of the team who are owners are not only accountable towards the team, but also

towards investors and whomever else they have brought into the project for investment purposes in order to “pull it off”. They might seem more accountable than the members of the team, who may lose a job but can leave without any debt if the project fails.

4.7.3 Becoming a team

As mentioned before, based on an intensive literature research Tuckman (Tuckman 1965) described the sequence of development in small groups as forming – storming – norming and performing. These stages of developing the group have been transferred into team theory as a descriptive mode, which is also shown by a search on scopus or google scholar.

Though Katzenbach and Smith also assume this process perspective on the formation of a team, they start out with acknowledging that a group is just a group, as can be seen in Figure 4.29, The discipline of teams. A team and a group are different in the way they work. This difference is the central factor affecting how they change from being a working group to becoming a team.

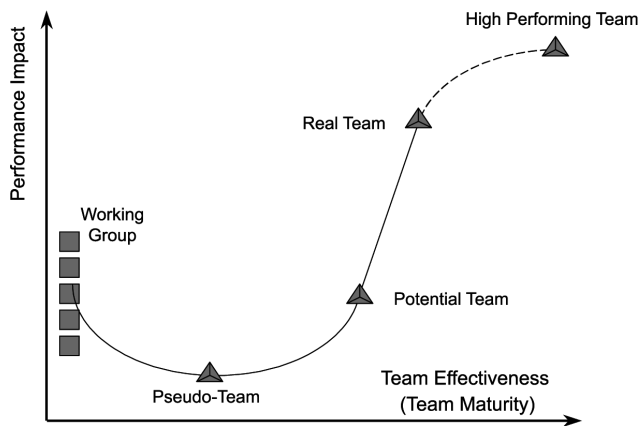


Figure 4.31: The Team Performance Curve

In figure 4.29, The Discipline of Teams, the working group has a structure which would fit very well with a hierarchical organization. So the change from a working group to a team is also a change of a hierarchical system, as pointed out by Drucker (Drucker, Harvard University. Harvard Business Review 1988). So where the working group follows established rules of conduct, the team as it has been described will acquire those in the process of establishing themselves as a team.

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What are then the characteristics of the various formations during their development from a working group to a high-performance team?

1. Working group: This is a group for which there is *no significant incremental need* or opportunity that would require it to become a team.

2. Pseudo-team: This is a group for which there could be a significant incremental. performance need or opportunity, *but it has not focused on collective*

performance and is not really trying to achieve it.

3. Potential team: This is a group for which there is a significant, incremental performance need, *and that really is trying to improve its performance impact.*

4. Real team: This is a small number of people with complementary skills who *are equally committed to a common purpose, goal, and working approach for which they hold themselves mutually accountable.*

5. High-performance team: this is a group that meets all the conditions of real teams, and has *members who are also, deeply committed to one another's personal growth and success.* (Katzenbach, Smith et al. 1993)

When evaluating how an organization has been working at the start of its existence, the characteristics which are listed above are very helpful. In order to keep the innovative company innovative, they must keep what served them well, working at the same time as they must adapt to a new and more complex organization.

In order to do so they must transfer the company from a high-performance team into a high-performing organization. (Katzenbach, Smith et al. 1993) As can be seen in Figure 4.32, (The High-Performing Organization, performance results are an effect of an interaction between shareholders – who provide opportunities, jobs and new challenges for employees, who in turn deliver value to customers, who generate profit for shareholders. If for some reason, the shareholders suddenly stop being ambitious about the objectives to be accomplished, the card-house falls down. In order to balance this circle, the management must be vision driven. It is interesting to see that in this context the technological innovation, which inevitably leads to a discussion of pure science vs. science vs. technology etc., is understood as a skill-based source of competitive advantage, in this way blocking the aforementioned discussion. Besides, one must expect that concessions have to be made when moving the model into a setting where the shareholder is also the management providing the leadership.

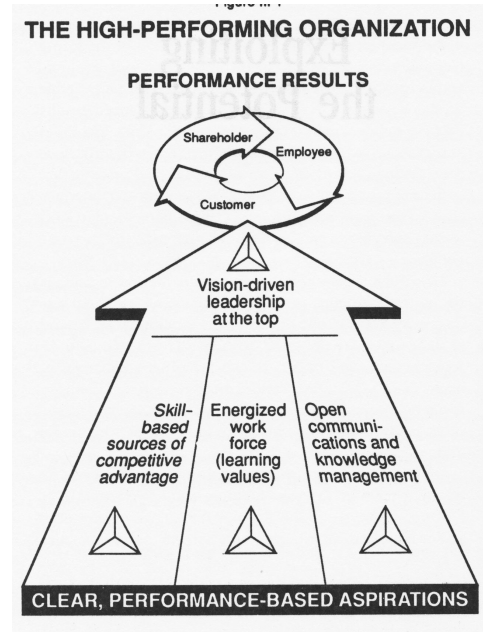


Figure 4.32: The High-Performing Organization

4.7.4 Founding team

As shown in chapter 4.2.3, entrepreneurship research has often been very person-focused. Entrepreneurs seem to be considered as people with specific traits or a special gene. The idea that somehow they differ from the rest of the population raised hopes that it might be possible to spot them and nurture their talent, much in the same way as you would prepare an athlete. Though, the problem is that research has not brought forth any such profile. Research into the process of entrepreneurship has led to a more nuanced picture of the pre-firm phase, eg. Gartner, who in his article “Who is an Entrepreneur?” Is the Wrong Question” (Gartner 1988) discusses the pre-firm phase as a process, involving several steps and actors, not just a result of a single individual’s endeavour. “Some have suggested that the term “entrepreneur” be dropped altogether, given its ambiguity in both everyday language and in the academic literature.¹¹ “(Ruef 2010) Having questioned the term entrepreneurship, Ruef (Ruef 2010) goes on to argue that a change in emphasis from the entrepreneur to the group does not mean that the question of “who is an entrepreneur” is obsolete, but rather that we should reconceptualise it. “Rather than split individuals into discrete categories of entrepreneurs and non-entrepreneurs, the perspective considers entrepreneurship to range on a continuum that connects individuals to entrepreneurial groups based on their material and time investments, social networks, identities, and goals.” (Ruef 2010) The scope of search for entrepreneurs is then expanded from the founders who are entrepreneurs to the entrepreneurial group. But with this expanded definition, part-time employees, family investors etc. are added to the process and to the group. Ruef’s arguments for widening the scope are as follows:

Regular Contributor to Organization

	No	Yes
Significant Financial Stake	No Consultant, Vendor or Helper	Yes Employee/ Manager
	Yes Investor	Owner - Manager

Figure 4.33: Ruef

Firstly, U.S. statistics show that entrepreneurs work in groups. Secondly, some entrepreneurs start by themselves not by choice but because of a limited social networks and different kinds of exclusion e.g. ethnicity. Thirdly,

¹¹ “I’m reminded, in particular, of a spirited panel discussion on this issue at the first Cornell-McGill Conference on *Institutions and Entrepreneurship* (July 2-24, 2007), in which Heather Haveman suggested that the term “entrepreneurship” be dropped from the social science lexicon, largely owing to the tremendous variation in the way it has been operationalized by researchers.”(Ruef 2010)

the narrative about the solo entrepreneur is popular both in mass-media and among entrepreneurs themselves. It is an interesting story, and easy to communicate but it is a myth. Fourth and last, to some extent this solo entrepreneur narrative has been adopted by academia without empirical data to support it and in doing so it reinforces the stereotype of the solo entrepreneur. (Ruef 2010)

That calls for a more nuanced definition of entrepreneur. It is not exclusively a question of either a single person or a group. The array of contributors in an entrepreneurial group can be wide. In Denmark there is a term “medhjælpende ægtefælle”, assisting spouse, who is a spouse that contributes a significant proportion of their labour to the other spouse’s enterprise. By marriage, they may be investors and legal owners. Also, you may have family investors, who act as angel investors, but may not work in the company. Figure 4.32 includes all types of possible contributors in an entrepreneurial group.

The quadrants in the table are backed up by data based on an empirical breakdown of U.S. start-ups in 2005-2006. This model focuses on the owner as the key to understanding the dynamics of a founding group. What may seem odd is the quadrant consultant, vendor or helper . According to a conservative definition of a founder, they should not have any role. However, they are by the owners considered to be an essential part of the start-up. Last, we have the group employee/manager. Even though brought in and paid, they may add to the start-up. Ruef stresses that in a given start-up some of the groups or quadrants mentioned in the table may be absent. Besides, a transition may occur over time between the groups.

Regarding the people who get involved in the start-up, attention has to be paid to the type of relation within the founding group. Ruef uses the term homophilious, indicating that founders tend to find more of the same traits which they already possess: the same ethnicity, gender, occupation, including even family members or friends or co-workers. The founding group will tend not to be too diverse in its configuration.

The configuration of the founding group was researched by Christensen, Ulhoi and Neergaard in their study for LOK (Christensen, Ulhoi et al. 2001). The field work for the paper was done in 2000 and 2001, which correlates with the period covered in the case study discussed in this study (see chapter 5.0.). Its focus is biotech and life-science industries as well as IT entrepreneurs, which is a category also covered by the case study in this paper. They found that most of the companies started in these industries were established by founding teams, which “constituted of 2-3 entrepreneurs, who tend to be connected to each other by family relations or close friendship. The successful establishment of a new company therefore seems to be fostered by the existence of strong personal ties among the members of the

entrepreneurial team. The evidence collected also indicates that the entrepreneurial team tends to have access to a broader network, constituted by weak ties to various professional businesses, and/or resource-providing individuals”(Christensen, Ulhoi et al. 2001)

As a theoretical vehicle to understand the process, Christensen and Ulhoi use social capital. They find that an entrepreneur who has social capital, termed a broker, tends to be male. Next, they add that a strong bond within the group/entrepreneurs is needed to form trust – and that this bond resembles family or friendship. Within IT-based start-ups “entrepreneurs tend to be younger than entrepreneurs in biotech and life sciences sectors. Whilst the former are generally aged between 18-30 and tend to be “self-made” persons, the latter frequently become entrepreneurs after having completed a higher education, often including a Ph.D. and some years of academic work.” (Christensen, Ulhoi et al. 2001)

Recruitment for the new start-up, and thereby for the founding team is described in the following way:

”The interviews have shown that during their first years of existence, entrepreneurs from both IT and biotech companies tend to recruit personnel from their close personal network, often through former educational or work-related relationships or even through family ties. These kinds of personal networks replace the more formal selection of employees because they appear to be safer since the entrepreneurs personally know the competencies and skills of the prospective employees, and reciprocal bonds of trust are already in place. Employees chosen through personal networks tend to be very loyal and to share the “pioneering” spirit of the entrepreneurs. Often, their dedication to the work goes far beyond personal economic gain, and they frequently work late into the night. In the IT sector in particular, where employees tend to be highly motivated youngsters, a common code of work- and risk-sharing is established.”(Christensen, Ulhoi et al. 2001)

Christensen and Ulhoi add that the growth and development of the company is not problem-free. In the IT sector, these growing pains are exacerbated by the young age of the members of the founding group:

“Problems with the division of labour and specialisation therefore arise early, as does the need for a professional, experienced management. As previously noted, young entrepreneurs often lack longer, formal education and business-related experience,

and thus might not be ready to face such a challenge. At the same time, growing firms require additional funds, which can often be obtained by trading shares. This in turn implies the need for a new, more qualified and experienced management. Seen from the point of view of the entrepreneurs, this represents both an opportunity and the end of an exciting era.”(Christensen, Ulhoi et al. 2001)

According to the authors, since a lot of the entrepreneurs start very young, there is a danger that they may leave the educational system altogether, thus creating new potential demands on the educational systems as well as on the companies which they start or work in.

“Young IT entrepreneurs often interrupt their studies early to start new businesses. These might succeed or fail. However, success or failure, young entrepreneurs often reach a point where further educational training is needed to equip them for a new role, be it as manager or small business owner, or where they need to opt for a completely different career option.” (Christensen, Ulhoi et al. 2001)

Still, if the entrepreneurs stay with the growing company, handling it places a huge responsibility on the young founders’ shoulders, as they have to handle a complexity for which they have neither training nor experience.

4.7.5 Team and innovation

Since the team is a pivotal point in the creation of a start-up, it is interesting to see if there is any specific innovation theory to describe the process going on in small teams. From the article about the David – Goliath symbiosis (Baumol 2002), we know that the small companies are producing more high-performing innovations than big companies . Baumol refers to a study conducted just at the turn of the millennium, which shows that:

- Small firms represent one-third of the most prolific patenting companies that have 15 or more U.S. patents.
- Small firm innovation is twice as closely linked to scientific research as large firm innovation on average, and so substantially more high-tech or cutting edge.
- Small firms are more effective in producing high-value innovations—the citation index for small firm patents averaged 1.53 compared to 1.19 for large firms.

4. Theory

- Small patenting firms are roughly 13 times more innovative per employee than large patenting firms.
- A small firm patent is at least twice as likely to be found among the top 1 percent of highest-impact patents as a patent from a large firm.

This shows us that historically there are no hindrances for small teams to create serious changes within an industry, as required by Schumpeter. So from the outset, the “small company” seems to have good chances with innovation. However, what about the small founding team?

Team structures in larger companies have been researched and it turns out that teams dedicated to innovation projects perform better than teams with a looser structure and less commitment. (Wheelwright, Clark 1992) Wheelwright and Clark note that the “heavyweight” development team has a manager who has “direct access to and responsibility for the work of all those involved in the project.” The manager has seniority in the organization, as well as expertise, experience and organizational clout. “Heavyweight leaders have primary influence over the people working on the development effort and supervise their work directly, through key functional people on the core teams. Often, the core group of people are dedicated and physically co-located with the heavyweight project leader. “ (Wheelwright, Clark 1992)

Even closer to the situation of a start-up is the **Autonomous Team Structure** With the autonomous team structure, often called the “tiger team,” individuals from the different functional areas are formally assigned, dedicated, and co-located to the project team. The project leader, a “heavyweight” in the organization, is given full control over the resources contributed by the different functional groups. Furthermore, that project leader becomes the sole evaluator of the contribution made by individual team members. In essence, the autonomous team is given a “clean sheet of paper”; it is not required to follow existing organizational practices and procedures, but allowed to create its own. This includes establishing incentives and rewards as well as norms for behaviour. However, the team will be held fully accountable for the final results of the project: success or failure is its responsibility and no one else’s.”(Wheelwright, Clark 1992)

The description of the conditions under which this team works, even given that the team functions within a larger organization, is very much what we have seen in the chapter about the founding team. Naturally, the founder has full authority. The team is centred around the founder/project leader, who has full control. They are allowed to build their own organizational culture. In the case of a start-up they have to, and they are indeed responsible for success or failure. Managing this team is described as:

“Dealing with these issues requires mechanisms and practices that reinforce the team’s basic thrust—ownership, focus, system architecture, integrity—and yet improve its ability to take advantage of the strengths of the supporting functional organization—technical depth, consistency across projects, senior management direction. We have grouped the mechanisms and problems into six categories of management action: The project charter, the contract, staffing, leadership, team responsibility, and the executive sponsor.”(Wheelwright, Clark 1992)

The project charter is so to say the mission which the project team has to achieve. The contract is substantially more like a plan you would make with a venture capitalist or with a large customer. It looks like this:

- Executive Summary
- Business Plan and Purposes
- Development Plan
 - Schedule
 - Materials
 - Resources
- Quality Plan
- Manufacturing Plan
- Project Deliverables
- Performance Measurement and Incentives

With this twist in the execution of the innovation project, it would seem that even though the team is given a lot of organizational freedom, with the introduction of the contract the realities are introduced, and the customer relation is fully established.

This work led to the development of a full plan for creating teams not only in regard to deliveries from the team but also including descriptions of each and every step, including a full organizational plan as well as a job description of everyone: project manager and core team members. The project leader has the following roles: Role 1 – must be able to translate customer and market needs, and be able to gather information from the outside (customers, dealers etc.) and inside from marketing. Role 2 – must be able to translate to and communicate with all functions involved so that

everyone agrees and understands the demands from the market. Role 3 – must have the qualifications to manage the engineering aspects, including all engineering sub- functions and integrate everyone into the concept decided upon. Role 4 – must keep everything moving in a face-to-face manner and champion the concept. (Wheelwright, Clark 1992)

“Compared to a traditional functional organization, creating a team that is ”heavy”—one with effective leadership, strong problem-solving skills and the ability to integrate across functions—requires basic changes in the way development works. But it also requires change in the fundamental behavior of engineers, designers, manufacturers, and marketers in their day-to-day work.” (Wheelwright, Clark 1992)

When you create teams in an existing organization, you have to make it a way of working and break down the usual boundaries between functions. In a new organization, you have to be aware that these boundaries should not establish themselves.

“Our research suggests that heaviness is not just a matter of structure and mechanism, but of attitudes and behaviour. Firms that try to create heavyweight teams without making the deep changes needed to realize the power in the team’s structure will find this team approach problematic.”(Wheelwright, Clark 1992)

Since a new start-up does not have any need for changes in its organizational operation, the chance is that they have found the benefits without the changes.

4.7.6 Team and learning

One of the things building a team has to address is getting the right people, which means people with adequate knowledge to solve the problems ahead. In a situation where the task is known, this problem is manageable, but in many cases not all knowledge is available at the start of a project – hence the question how a team handles learning. Katzenbach and Smith (Katzenbach & Smith 2003) found that even though everyone wanted knowledge present, it was never readily available, “Yet in our research, we did not meet a single team that had all the needed skills at the outset. We did discover, however, the power of teams as vehicle for personal learning and development.” (Katzenbach & Smith 2003)

What they found was that the focus on performance made the team realize the knowledge gap, and the commitment made the team fill it. The sheer desire to be in the team and to succeed makes the individuals do whatever it takes. “Accordingly, as long as the skill *potential* exist, the dynamics of a team cause that skill to develop.” (Katzenbach & Smith 2003)

Katzenbach et al give no further information regarding team and learning. Their focus is on creating a team. Still, they do acknowledge that learning takes place. Actually, they see it as a prerequisite for a high performing team so they register it. However, how it plays out generates no further interest. If researchers into team dynamics do not take any interest in teams as a vehicle for learning, then who does? Studies of teams or groups have been used for the following:

“The leaning towards cross-disciplinarity that characterizes much scholarly work in this area reflects the fact that no single discipline deals with all aspects of innovation. Hence, to get a comprehensive overview, it is necessary to combine insights from several disciplines. Economics, for instance, has traditionally primarily dealt with the allocation of resources to innovation (in competition with other ends) and its economic effects, while the innovation process itself has been more or less treated as a “black box”. What happens within this “box” has been left to scholars from other disciplines. A lot of what happens obviously has to do with learning, a central topic in cognitive science. Such learning occurs in organized settings, e.g., groups, teams, firm and networks, the working of which is studied within disciplines such as sociology, organizational science, management and business studies.” (Fagerberg 2004)

The learning organization as characterized by Senge (Senge 2006) describes a learning team as something that need to be practised. Several ground rules have to be used, specifying the list of conditions under which work and training should be done:

1. Having all-members of the “team” (those who need one another to act) together
2. Explaining the ground rules of dialogue
3. Enforcing those ground rules so that if anyone finds himself unable to “suspend” his assumptions, the team acknowledges that it is now “discussing” not “dialoguing”
4. Making possible for, or indeed encouraging team members to raise the most difficult, subtle and conflictual issues essential to the teams work. (Senge 2006)

Senge proposes dialogue as a tool, based on Bohms’ work (Bohm 2013) first published in 1996, derived from his knowledge of how scientists should

work. Bohm discusses dialogue as a means to learn, as a contrast to discussion. A dialogue means that everyone is contributing, whereas a discussion is about winning. This means that you have to be aware of what assumptions you have. You have the responsibility to be able to suspend them, which means being aware of them, but not being guided by them. “In a dialogue, there is no attempt to gain points, or to make your particular view prevail. Rather, whenever any mistake is discovered on the part of anybody, everybody gains. It’s a situation called win-win, in which we are not playing a game against each other but with each other. In a dialogue, everybody wins.” (Bohm 2013) As soon as a discussion starts, with the purpose of persuading someone to accept the opposing view, it is a question of winning instead of learning. As long as the dialogue is going, everyone is contributing and learning.

Senge takes the view that if you want to be a learning team, you have to be able to get to a point of decision making. Therefore, the team has to be able to switch back and forth between dialogue and discussion, combining both learning and accomplishment as a team. De Dreu and West discuss minority dissent (De Dreu, West 2001) in connection with individual creativity. Their hypothesis is that minority dissent might predict innovation in teams but only when teams have high levels of participation in decision making. Whereas De Dreu is concerned about dissent and room for dissent in the decision processes, Bohm’s concern was the dialogue that would allow all arguments and facets to be heard. Being heard is viewed as learning-as-participation by Sfard. He claims “Moreover, the ongoing learning activities are never considered separately from the context within which they take place. The context, in its turn, is rich and multifarious, and its importance is pronounced by talk about situatedness, contextuality, cultural embeddedness, and social mediation.”.....” To put it differently, learning a subject is now conceived of as a process of becoming a member of a certain community. This entails, above all, the ability to communicate in the language of this community and act according to its particular norms. The norms themselves are to be negotiated in the process of consolidating the community. (Sfard 1998) So as a participant in a team working on something special and thereby learning or studying something special you have to be participating, and you have to be able to communicate with the community and conform to their norms. Otherwise, you will not learn.

What seems dominant is that learning in teams occurs through interaction and dialogue. The team has to be a real team. They have to work together and to make decisions together. With this foundation they can achieve their objectives, create innovation and learn.

4.7.7 Team and creativity

When researching literature concerning creativity, the first aim was obviously to define the topic (chapter 4.5.), which revealed difficulties with distinguishing it from innovation. When applying the term of creativity to an organization, Puccio and Cabra quote Woodman Sawyer and Griffin (1993) who define it in the following way “Organizational creativity has been defined as “the creation of a valuable, useful new product, service, idea, procedure, or process by individuals working together in a complex social system”” (Kaufman, Sternberg 2010). This may seem an odd way to start a discussion about team and creativity, but it is the actual beginning of Puccio and Cabra’s contribution on the subject of organizational creativity in the *Cambridge Handbook of Creativity*. (Kaufman & Sternberg 2010) The aim of their contribution is to describe a model for creativity, hence an understanding of what it includes seems appropriate.

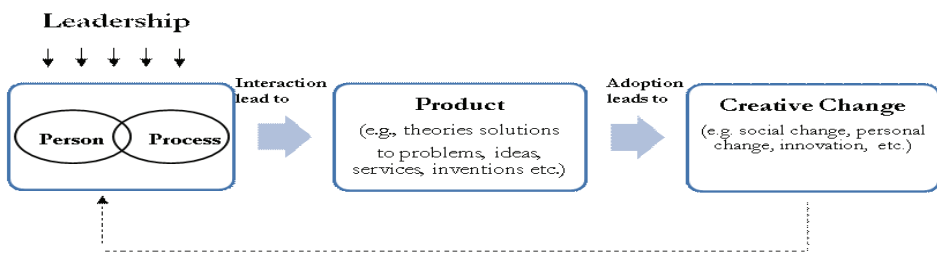


Figure 4.34: Creativity a Systems Model Puccio and Ccabra

The model shows that there is an interaction between persons, processes and leadership. This, in turn, gives a “*product*” which can take many shapes, among them invention. The adoption of the “*product*” leads to Creative Change and as such innovation.

Person is the individuals, their skills, background, experience, personality, knowledge, motivation, and so forth.

Process relates to the stages of thought people engage in when working alone or with others to creatively address predicaments and opportunities at work.

Environment relates both to the psychological and physical setting in which a person works. Pucio and Cabra (Kaufman & Sternberg 2010)

The above model is then used to organize the literature review. What seems

interesting is the process aspect, since so far defining the process of creativity has been very elusive (Ford, Harris 1992). In this case what the authors argue is that creativity is furthered through the individual together with the process and the conditions under which they do it.

For a start-up, the person or persons who set up the start-up are a given. However, this is not the case when team creativity is to be enhanced in an existing business. Then, the team can be put together from all sources both internal and external. The founders of a start-up so to say choose themselves to be the persons involved, which in no way means that their personality and background are of no importance. Yet, the set-up cannot be altered until the founding team is put together, at which point the skills, experience etc. can be balanced. Changes in environment are known to happen in existing companies, for instance Oticon, where the change was due to a new organizational structure. Pucio and Cabra (Kaufman, Sternberg 2010) (Kolind & Paludan-Müller 2006) The environment in which creativity takes place is an important factor.

Pucio and Cabra refer to a study undertaken by Ekvall (Ekvall 2000), in which the focus of the research was to see if seemingly standardized management systems hinder creativity. The study involved engineering graduates from Chalmers Institute of Technology, but it also included data regarding other graduates who classified themselves as working as engineers. It compared concepts such as Lean and TQM with project-groups and creative methods. The results showed that among R&D and production engineers, project-group and creative methods were viewed as the best methods for creative work. It seems, though, that Ekvall is able to support the idea of the team being an important factor, since organization of work was as important as creative methods.

Napier and Nilsson (Napier & Nilsson 2008) introduce a framework for creativity and innovation. They operate with a framework consisting of three elements. Faces are the people who are involved in the process. Places are the venues where it takes place, not only geographically but also what type of offices, buildings and layouts. The third element, Traces, is about creating the best organization – or as they say creating magic in an organization, which acts as a catalyst. There are several levels of handling this process. To perform in this framework, you have to start with Mastery: Within Discipline Knowledge, then move on to Out of Discipline Thinking, and last but not least secure a Disciplined Process.

Faces

At least three types of roles, or faces, are important within organizations seeking to be innovative: creative entrepreneurs, creative leaders, and creative team members. These roles might shift across different people over time, but they embody tasks that need to be completed within creative or-

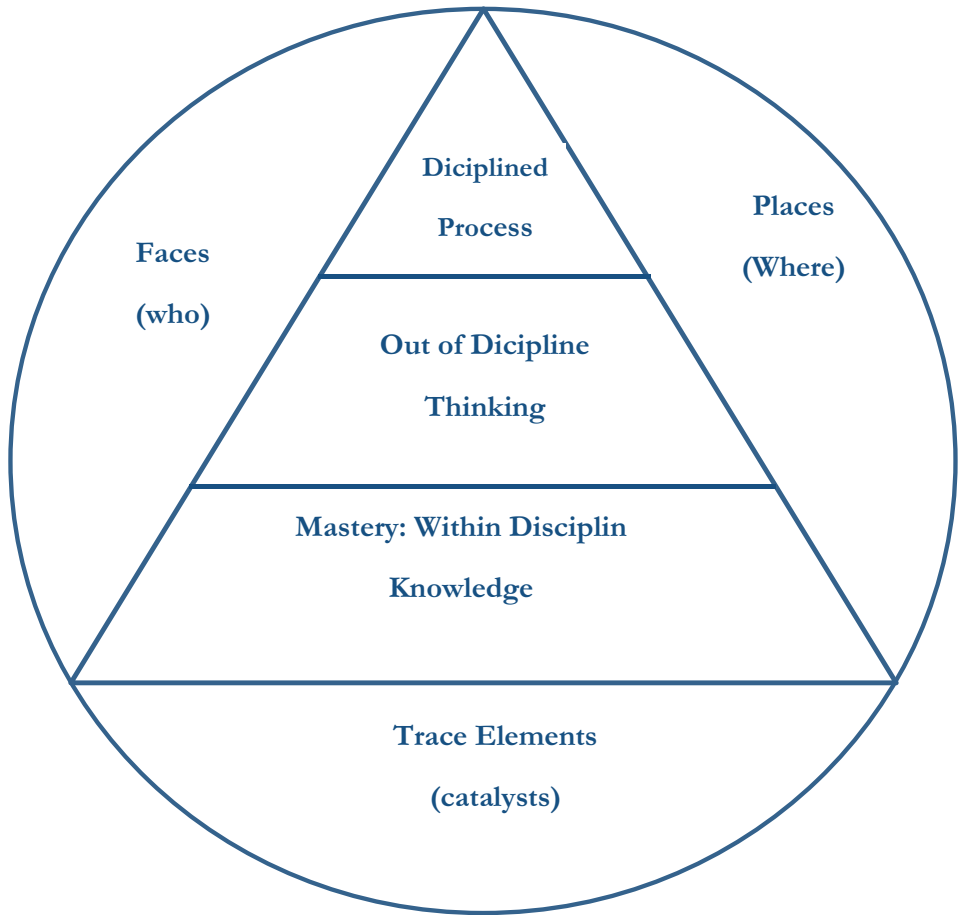


Figure 4.35: The Creative Dicipine Framework (Napier, Nilsson 2008)

ganizations. (Napier, Nilsson 2008) Creative teams differ from some work teams in that their motivation may be contrary to what economists might predict. Some creative team members are motivated less by financial gain than by other factors. Typically, they are curious about and want to solve a problem, but not just “any” problem will do. It needs to be “worthy” of the group’s time, effort, and both mental and emotional investment. Groups that have achieved extraordinary and sometimes unique outcomes focus on such projects that mattered. They mattered to them, and to the community beyond themselves. (Napier & Nilsson 2008)

Places

Places addressed the question how the interior layout influences the way innovation and creativity flows. The importance of this element lies in what has been previously hinted at in Kolinds’ book about Oticon and

the spaghetti organization, which illustrates an organization without offices - only open spaces and workers moving around when changing from one project to another.

Traces

Traces are defined as a possibility to work on your ideas, which can be furthered by the practice within the organization, its culture and how it works together. Practice is viewed as expectations and recognition. In culture conducive to innovation people acknowledge that innovation and creativity are not centred around a few but are grounded within the organization.

Within Discipline: being with the best

Being part of an organization that people know and think highly of, like Google, Nokia, or Wipro, can give one a springier step, a sense of pride and loyalty. And belonging in a top organization implies that the people within it are among the best in the field. So both being the best and being with others who are the best pushes organization members. First, they need to prove to themselves and others that they deserve to be among the best. Next, to stay on top they are constantly learning; and finally, they never want to drag others down (or be pulled down) by not keeping up with the best. (Napier, Nilsson 2008)

Out of discipline thinking

“Lonely are those in science, art, and organizational management who hold views that integrate ideas from different disciplines, or who stretch beyond the prevailing assumptions.” (Napier, Nilsson 2008) this quotation seems to be the quest that innovative thinking goes against the status quo. Those who question established thoughts and procedures often face a wall. The problem for the team or company is therefore to accommodate this new approach.

Disciplined process

The search for a precise definition of a process for creativity and innovation has been going on for long. As described in chapters 4.3 and 4.5 when addressing it, Napier and Nelson have not come any closer to a precise answer. They acknowledge that there is more than one right way. They argue that the process has to be disciplined, and to achieve that they argue that you should consider, “*What is your framework? Process matters. Where is time well spent? Synchronize and temper your ideas.*” (Napier, Nilsson 2008)

The above is not a blueprint but a short-list of things. You have to come up with your own solution.

According to the authors, how does a creative team work? They see four different approaches:

- *Star collaboration*: Someone is the central point from which the creative activity begins and through which collaboration takes place, like a the-

atre director.

- *Pyramid collaboration*: There is someone who, like the coach of a football team, coordinates and reviews ideas coming from lower levels of the organization.
- *Amoeba collaboration*: A fluid collaboration approach emerges, where dispersed sources run across the organization.
- *Fireworks collaboration*: There are sparks of creativity and multiple bursts of ideas that land in different places of the organization; this creative explosion and collaboration lets small ideas have a chance to grow. (Napier, Nilsson 2008)

As can be seen above, the authors describe approaches to a creative team which are all set in larger organisations. So when it comes to a start-up team, there is a need for adjustments. But no matter how ideas to be worked on or vetted in an organisation are selected, it is clear that in order to make a transition from an idea to an invention to innovation, a collaboration among members of a team must take place.

The Cases

5.1 Choosing the case

In order to analyse the cases for this study, it is important to revisit the conditions under which the case complex was chosen, as this process became part of the pre-understanding of the cases. You go in search of a case – and when you find it, it turns out that the case may have so much more to offer than what you anticipated. In this case, the search was for a successful, recent, technology-based start-up, in order to see how engineers handled the process of starting a company. The original case came as a result of a search for start-up companies among my former students. A few cases came up, some were investigated further, and finally one case was chosen. What attracted me to it was the high-tech aspect and the fact that it had been started by students.

It might be argued that the case so to say found the researcher. That is, at first it fitted the criteria which were set up. It was a recent and successful start-up. The case held a promise of adding to the scope of the research, as it turned out to be about more than just the engineers starting a company. So looking for information on how engineers started companies and ending with a case in which companies were started by students made it all so much better and more relevant. After more dialogue with my former student, who is now Global Marketing Manager, I was told that the company was set up as a result of participating in Venture Cup, where they had done very well. Being familiar with the general purpose of Venture Cup, a competition among students for making the best business plan served to make this study even more focused. However, it also meant that not only the founders but also the organization which staged the competition in entrepreneurship had to be included in the analysis. Venture Cup, which is the largest university-based business plan competition in Denmark, will be described in chapter

5.4 Its purpose is to get students to create new high-growth companies in Denmark by letting them enter a business plan competition, as well as by giving them knowledge and coaching – together with the prize money for ending up in the top 3. This twist to the search accentuated the possibility to actually see if the concept of teaching a business plan had a positive impact on the survival/performance of a venture. Again, this added the effect of having a business plan competition to the scope of the research. So in fact, one could say that the case started maybe not governing the research but definitely opening up new venues for it. Additionally, since the scope was start-ups based on an innovation, the case added the angle that the company had actually changed an industry in so far as the whole production had been changed, complying with the theory founded in Schumpeter's (Schumpeter 2008) demand that the entrepreneur changed an industry. So the choice of a case led to a change in the scope of research, and again led to a narrowing down of the research goal: not only to find out how technology start-ups were handled in general but how they were handled by students. Secondly, it substantially improved the chances of finding a link to how to teach in a way which includes innovation and an entrepreneurial behaviour in and for the students.

As the actor network theory prescribes, we have, among other things, the actors, actants, time and place. The contrast between the hero entrepreneur and the actual cooperation with others and relying on society to supply certain services and facilities free of charge shows how complex a start-up is. The story could have been the following: two students met, started a company and developed a product which became very successful. However, the process is not that simple. It may take a village to raise a child, but it takes a whole lot of things for two students to come together and do what they did. They could probably have done it in a different way, but then it would not have been this process and their circumstances, which are about to be described.

In order to describe their process, we need a larger view on the situation and the people involved. In this case, we have more actors than the two students involved. In the diagram, the elements with “a shadow” represent actors, while the clear ones are actants.

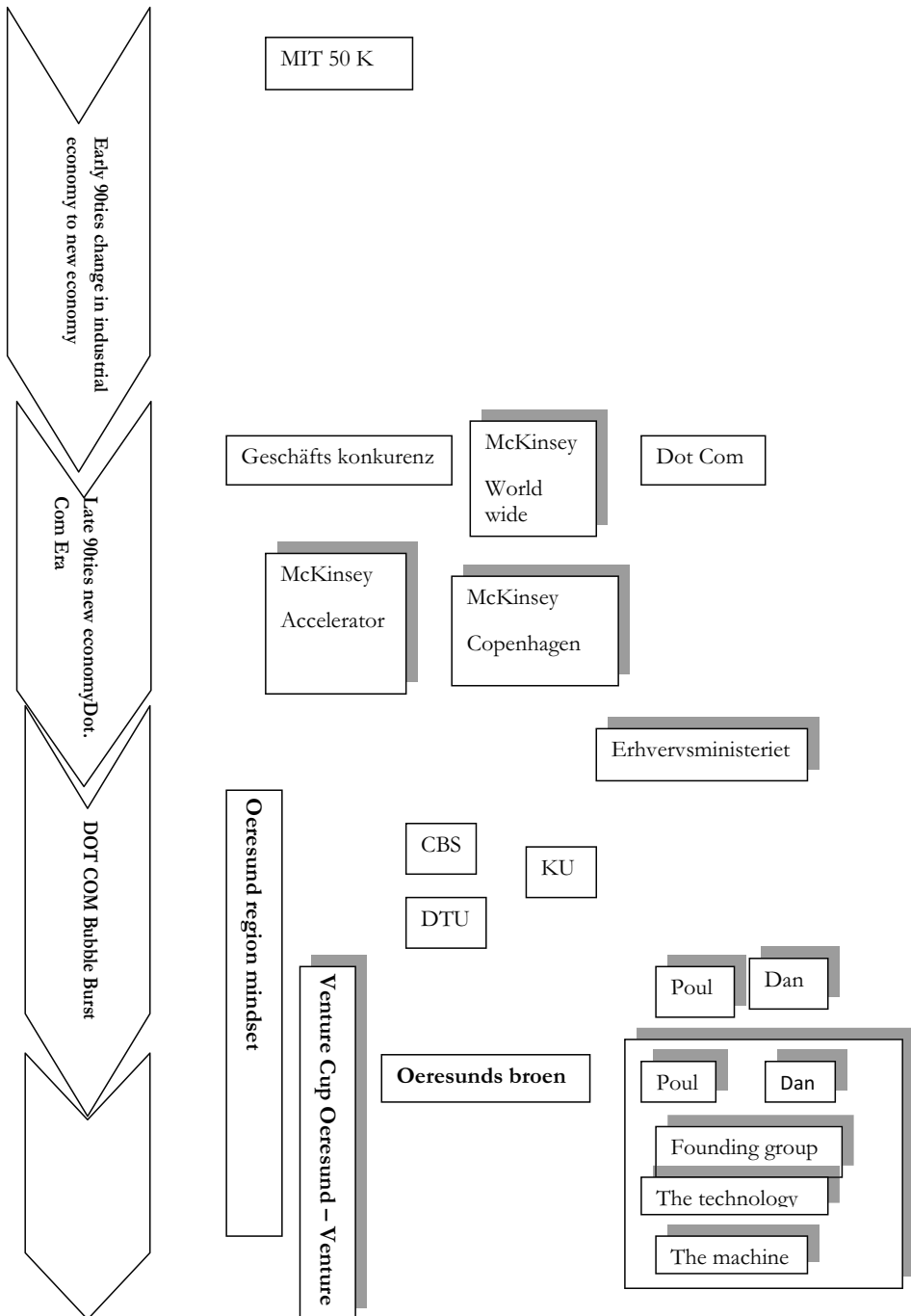


Figure 5.1: Ant plan of the cases

the diagram shows the following elements "The Company"

"The Company" founders

"The Company" founding group

Technology

Product/s

Venture Cup

Founders CBS

The decision makers

The active participators from the organisation

DTU

The decision makers

The active participants from the organisation

McKinsey

The decision makers

The active participants from the organization

The Venture Cup organization

personnel

The Venture Cup offer

The competition

The prize

The assistance offered

The place in which it took place

The time in which it took place

With the development of the case/ cases more actors or even actants may appear. But the preliminary diagram shows the potential influences on the process of creating one new company.

5.2 Themes in the case

As described in chapter 5.1, the choice of the case company led to the addition of Venture Cup to the case. It also had an influence on the areas to be covered, that is the themes of the case:

The role of Venture Cup

Venture Cup needs to be fully comprehended and treated as an entity in its own right in order to understand why it emerged at the time it did, and how it influenced the start of "The Company". It is important to understand it not only as a trigger but also in what way the process of how Venture Cup works may have influenced the way "The Company" was created and acted, especially since Venture Cup is a business plan competition. However, Venture Cup also offered opportunities to meet mentors and get in touch with venture capitalist. It offered a chance of guidance and support. How

this assistance was perceived by the founders of the start-up, will therefore be examined.

The importance of a business plan

It is easy to see why business plan is so important for Venture Cup. One could expect it to be as important for "The Company" in the case study, but is it? Consequently, we shall have to consider whether it is possible to start a company without a business plan and whether a business plan is at all important for a start-up.

Financial risk

Among other elements, a business plan deals specifically with the need for capital and for assessing how much is needed. It is also an attempt to minimize the risk for the new venture. So how do students evaluate this financial risk? How do they make the transition from seeing something as an opportunity to win prize money in a competition to putting up the money themselves, so they run a chance of losing money instead of winning it? How do they assess the risk, and how do they secure the money? Students have very little equity, if any, and possibly more debt than assets, so they might have been affected by the perceived risk.

Founding Team

As shown in the chapter on theory, within the earlier paradigm entrepreneurs were unique individuals who were believed to possess a special quality, even gene, which made them different from everyone else. Nowadays, the complexity of start-ups seems to have changed that outlook. Consequently, the first team that joins the start-up will be given the most interest in this study.

The customer

The influence of a customer is interesting in more than one way. In the business plan, the potential customer base is estimated, and the future demand is sized up in an attempt to assess the market potential. However, the customer is then no more than an object of research, or at best an informant. But a customer can also be just that an individual who buys your goods or makes you manufacture the product they want. In the case described, the customer plays a very central role in the initial phase of the start-up, and is therefore essential to understand the process.

Technology and the machine

In a start-up, it is to be expected that the technology and the machine which is the product must play a certain role for the founding team. But is it just an opportunity or is it more than that? Does it play a larger role than just being involved in the start-up? Does it have a role in line with an actant, as described in chapter 4.6?

Motivation and learning

Motivation and learning are addressed as an important part of how a founder and a founding team work. A student start-up is easily synonymous with a serious lack of experience, which necessitates learning, not only with regard to the product but also with regard to simply running the business. How do the founder and the founding team stay motivated? What motivates them? Coming from a situation where learning is constantly offered not only as an option but as a requirement, how do they handle a situation where they need to be aware of possessing insufficient knowledge and find solutions or access to that knowledge? In chapter 4.7.6, learning is considered the hallmark of a high-performing team. In this study, we shall examine how a high-growth start-up handles the issue.

Then and Now

As a company matures, something must go amiss. One of the points of this research will be to illuminate how the members of the founding group see the changes that have occurred over the years. We shall examine whether there are things from the past that they either miss or consider as having improved.

5.3 Writing the case

The process of collecting data for the case and writing up the case was naturally strongly influenced by the theoretical pre-understanding. If you set off with the assumption that innovation and entrepreneurship are a one-man endeavour, looking for either the Grand Story or a gene or the genome of an inventor or an entrepreneur, you will build the case in line with many biographies about big empire builders and inventors such as Alexander Graham Bell and Thomas Edison. Consequently, in order to get the true picture, we shall need to hear the founders' story as well as the story told by the first employees, that is the founding group, who are not owners but have a stake in the start-up.

5.4 Venture Cup – the history behind the competition

In the beginning of the 1990s, McKinsey & Company saw a change taking place in their business base. High-growth companies seemed to be shifting from an industrial economy to the “new economy”, powered by the arrival of the Internet. Since start-ups were not a typical customer for McKinsey, which traditionally worked with very large, often industrial, corporations, these small start-ups did not fit the profile of a possible customer.

“One of the most noticeable changes was a drift away from its long-standing policy of not linking its fees to client performance. Bower believed alternative fee arrangements could tempt consultants to focus on the wrong things. During the past 18 months, McKinsey has been structuring dozens of deals with blue-chip companies that call for the payment of an assignment-ending bonus if a client is satisfied with the results. In the past three years, it also began accepting payment in stock from approximately 150 upstart companies, though McKinsey points out that this is a small percentage of its 12,000 engagements in that time. Gupta says the change allowed the firm to serve smaller, innovative companies that didn’t have the cash to pay McKinsey’s standard fees of \$275,000 to \$350,000 a month.”(Byrne, Muller et al. 2002)

In order to gain access to this market, McKinsey chose a rather risky course of accepting shares. Another factor that may have caused the focus on the new dot.com market, was the establishment of incubators for the start-ups. In the case of McKinsey, a concept called *Accelerator@McKinsey* was set up, and was expanded until the end of the dot.com era. However, there may have been yet another reason for the attention the start-ups received:

“The in-house management consultant incubators such as *Bainlab* and *Accelerator@McKinsey* have attracted some scepticism because, reluctant as they are to admit it, much of their motivation lies in the need to try to halt haemorrhaging of their best people to dot-com start-ups.” (Campbell 1999)

McKinsey addresses this in the following passage: “For example, in 1997, a significant proportion of all graduates of Harvard Business School went to work for start-up companies in which they received large equity stakes.” (McKinsey Conference 1999 Global Corporations Switzerland)

Since quite a few of McKinsey recruits graduated from universities in the booming dot.com age, a job with a payment in shares could seem to them a lot more attractive than a typical salary job.

“In an average year, McKinsey will offer consulting jobs to 3,100 MBAs and professionals in the expectation of getting roughly 2,000 acceptances. In 2000, however, more than 2,700 people accepted offers to join the firm.”(Byrne, Muller et al. 2002) This stresses the need for a close cooperation with universities. The reason is a large turnover in staff. Generally speaking, McKinsey has a “move up or move out policy”, which means that young people are either promoted to bigger jobs within the organization or leave the company to take on a good job with e.g. the clients.

When the idea of Venture Cup was introduced, a McKinsey representative from Denmark said in an interview that the competition was not a global plan, but one which was observed to work in other places, and adopted into each country by local management.

To pinpoint the origin of the competition more precisely has not been possible. However, the following factors may have prompted McKinsey to consider business competitions:

- They needed to have very close links with universities, which were their primary source of new staff. As mentioned above, McKinsey needs a large flow of candidates.
- They were apparently losing out in their recruitment to start-ups, and therefore, they had to take action
- The new type of businesses couldn't afford to pay their fees
- They needed to spot both talent and future customers early

Something had to be done. McKinsey needed to be in the market of start-ups both to spot the potential future customers, but also to be where their draftees make the decisions between a career as a start-up or a paid job. Therefore, they got involved with business plan competitions based on the MIT 50K. In "Businessplanwettbewerbe in Deutschland : eine explorative Analyse" (Harms, Schmengler 2003) it is stated that the oldest business plan competition was the MIT 10K, organized by Massachusetts Institute of Technology, which according to Harms und Shmengler (Harms, Schmengler 2003) took off in 1990. The reason it has two names is that it started out with the intention of raising 10,000 USD but exceeded that amount and raised 50,000 USD instead. Since then the amount has grown. Subsequently, McKinsey developed their own venture competition consisting of three phases: 1st an idea competition, 2nd a market research competition, and 3rd a business plan competition.

This concept was picked up by European offices in 1996. It was adopted in Berlin, in south Germany and Switzerland. In 1998, it started in Holland under the name New Venture Business Plan Competition, which still exists today. And in 1998, it was started by McKinsey in Sweden in Stockholm, Luleå and Gothenburg. In 1999, it eventually came to Denmark and started as Venture Cup Oeresund, again organized by McKinsey.

One of the first things produced by McKinsey was the manual describing how to start a business plan competition. In addition, a business plan manual/book was produced and published in Munich, Europe in 1998.

The reason for organizing Venture Cup Oeresund as a regional instead of a national competition was the fact that McKinsey in Copenhagen was responsible not only for the Danish market but also for the build-up of activities in the southern part of Sweden. Hence, it needed contacts to universities for recruitment purposes. Secondly, McKinsey was working with the development of the Oeresund region for Erhvervsministeriet (the Danish Ministry of Business and Industry). The introduction of Venture Cup into Scandinavia was carried out in cooperation between McKinsey Sweden and McKinsey Denmark.

In Denmark, the build-up was run and funded by McKinsey. It should be noted that at that time McKinsey was building up the Accelerator@McKinsey program, a service where McKinsey sought to house new start-ups at the same time as the company was offering consultancy. Accelerator@McKinsey was registered in Denmark in 2000, shortly before the collapse of the IT-Bubble and hence the demise of the dot.com era, which put an end to the whole project.

The start-up of Venture Cup involved the following universities:

University of Copenhagen

Copenhagen Business School (CBS)

Denmarks Technical University (DTU)

Lund University – Sweden

The central players in the Danish competition were CBS and DTU, represented by the respective rectors Finn Junge Jensen and Hans Peter Jensen. On a more practical level, McKinsey remained the project manager and founder, though in cooperation with students at CBS, among them Inner Student Network, based on a course taught by Henrik Herlau on how to use patents, which was a kind of a beginning of research into invoicing (fra forskning til faktura). Paid by McKinsey, the young students were used to market Venture Cup Oeresund. It was done as gorilla marketing. They went to the other universities and put up posters as well as contacted students in order to create interest in the project.

McKinsey started up Venture Cup in Finland and Sweden. The competition in Sweden was organized in subgroups east, west and north. Southern Sweden became part of Venture Cup Oeresund in 2000. The target group was everyone provided that each group included a university student.

Based on the structure it had all over Europe, the competition was conducted in three phases: an idea competition, a market analysis for an idea and finally, a full business plan. In order to make students perform better, other people were called in to talk on different subjects. Among the speakers, there were many of McKinsey's consultants. The German/Swiss book on the business plan, *Starting Up* (Kubr, Marchesi et al. 1998), was translated and adapted into Danish under the title *Forretningsplanen: håndbog for nye virke-*

sombeder (Dahlström 2000). The authors were key McKinsey people in this project.

At the beginning, the jury in the competition consisted of prominent business people such as Jørgen Mads Clausen ¹, Asger Aamund ², etc., whose job was to choose the winners.

Details concerning the support system for the participants remain unclear after interviews with representatives of both McKinsey and Venture Cup. There has been some disagreement about the issue: Tanver Sharif, who was the second CEO of Venture Cup Oeresund, is sure that the support system with mentors, etc. was in place from the beginning, whereas others have stated that it came later.

The organization was based on three groups:

The Advisory Board. Its members were prominent business people who gave the organization respect and recognition, and helped in dealing with universities, sponsors and other organizations.

The Jury. There was an overlap between the jury and the advisory board, but some members of the jury were not part of the advisory board.

Mentors. This was a group formed within the first year as volunteers from McKinsey. When the organization was transferred from McKinsey to Venture Cup Oeresund, the students in the organization were tasked with finding mentors.

The fact whether the above structure was really in place is debatable. As it will be shown later, the case company described in this study recalls that they got in contact with "The First Customer", though not as part of Venture Cup. On the other hand, one of the McKinsey employees believes to have brought the case company in connection with "The First Customer" and have given them an introduction. He did not express that it was part of a function as a mentor. Therefore, the question remains whether Venture Cup Oeresund had a fully functioning system integrated in the competition or it was just an option available to the students, which could explain the discrepancy in the data. Today, both mentoring and support are an integrated part of the competition.

One of the major changes since then has been the capital or rather its lack. In 1999 – 2000, venture capital was booming due to the IT Bubble. This has changed since, but as the people involved recall it, capital was not a problem at the beginning but became an issue when the IT bubble burst.

The organization was anchored in McKinsey, who funded the organization and its employees. In 2000-2001, a transfer of responsibility from McKinsey to Venture Cup Oeresund took place. For McKinsey, it was important

¹ CEO and majority owner at Danfoss Sauer

² CEO and founder, investor in medical industries

that in this transitional phase the organization maintained the professional operation of the organization so that the brand could be sustained. After the first competition, the organization was moved from McKinsey into its own association. The charter stipulates that it is an independent organization, in which universities can be partners. This remained to be the case later when the organization changed from a bilateral organization to a Danish organization. Next, a limitation on the duration of being CEO of Venture Cup was implemented in order to avoid creating a person-based brand for Venture Cup. At the start, everyone could participate in the competition, as long as there was one university student within the group.

There is no final information stating the charter and mission of Venture Cup when it started, but everyone seems to be able to agree with the mission stated today at www.venturecup.dk:

”We are here to help! For the past 10 years we have worked to help and inspire young entrepreneurs. Supported by the Danish universities and some of Denmark’s most innovative companies we have strong support and the right mindset to help you succeed.

We provide **funding** via the competitions, key **networking** networking opportunities, and vital **feedback** for your idea. We will train you to do an awesome pitch, guide your focus in the early stages, and build a bridge to springboards and investors.”

Mission

Venture Cup works to inspire and empower university students and researchers to develop their ideas into successful companies.

Our purpose is two-fold; to inspire and motivate entrepreneurship among students, and to turn academic knowledge into viable high-growth businesses.

We focus on entrepreneurship as a practical discipline and we expose our participants to a great network of experienced entrepreneurs and business people, who provide valuable advice on a volunteer basis because they share our interest in finding and supporting Denmark’s leading start-ups.” (www.venturecup.dk)

Politically, the Swedish officials understood that something was happening with start-up companies, and decides to invest in this area. The Venture Cup concept was prioritized in Sweden and it was heavily funded. It is an active part of the political agenda. The same was true in Finland. Sweden’s focus on entrepreneurship and funding of Venture Cup Oeresund with regard to the activities in Sweden made it impossible to maintain the organization. The political systems were too different, and it was impracticable to work across the border. In practice, this caused the end of Venture Cup Oeresund.

In Denmark, the situation was that Connect Denmark, another organization supporting start-ups was set up at the same time as Venture Cup Oeresund. But there was no coherent plan for how to enhance entrepreneurship. There was a different resonance in Denmark with officials and politicians than in Sweden. It was business people who had to take upon them the job; it was people like Jørgen Mads Clausen from Danfos, Kim Østrup from IBM or Carsten Colin from Ernst & Young.

In 2002, Venture Cup Oeresund in Denmark did not have any money, which led to a split of the Venture Oeresund so that from 2003, there was a Venture Cup south in Sweden and a Venture Cup in Denmark. The separation was needed to ensure state resources in Sweden, not to mention the fact that in this way sponsor aid could be spent in the countries it was intended for.

The fact that Venture Cup Denmark lacked funding for the program required the CEO, Kristian Snedker, as he puts it, to think like a thoroughly commercialized lobbyist. To get the same consistency of entrepreneurship activities in Denmark as has been seen in Sweden, a system developed with Young Enterprise for high school students, Venture Cup focusing on higher education, and Connect Denmark open for everyone. That division was accepted by the political and administrative systems, primarily the Ministry of Trade and Industry and the Ministry of Science.

Venture Cup Denmark survived this transition primarily due to help from Finn Junge Jensen, Rector of CBS, who sponsored an office. Together with the Dean of DTU, Hans Peter Jensen, he was instrumental in securing the survival of Venture Cup.

In 2003 – 2004, in order to finance the organization Venture Cup tried to professionalize their training sessions and turn them into ECTS point courses.

From then on, the organization has been constantly professionalising and expanding. Today, it has offices at all universities in Denmark. As for the political agenda, nothing has changed. It is still the official policy that everyone from kinder-garden to Ph.D. has to be exposed to entrepreneurship as part of their education. The question remains if Venture Cup is the best way to promote entrepreneurship, and to turn academic knowledge into viable high-growth businesses.

5.5 "The Company"

Why the name "The Company"? The dialogue with the owners about this subject has been intensive. Very early on, they decided not to be part of the public scene. If you search for information using their full names, the

search hardly turns up any data. If you look for articles, there are few trade articles about their products. As so many members of their generation of start-ups, they could have led public lives but have chosen not to. They do not participate in red-carpet events. Likewise, they do not flaunt their wealth. Actually, you have to know them to know who they are and what company they own. Moreover, you have practically to be in an industry they service to know their company. But if you are in their target market, you know them more than well.

When looking for the history of "The Company" on their home page, the story is truly brief. It is just one way of describing how "The Company" came into being, and as such it is very short but precise. Unfortunately, the narrative does not give much information about the process of how "The Company" was created.

"The Company" History

"The Company" story states that it was started by two graduate students, so ambitious that "The Company" experiences rapid growth, which earns them reviews such as "The Google of the their industry". In less than a decade, "The Company" makes decisive developments for the benefit of various major industries.

"The Company" starts out providing services for one industry but has since grown to service several industries. It is head-quartered in Copenhagen, and prides themselves on having the largest specialist team working on their technology. They have facilities spread around the world.

Despite being a truly international company, "The Company" is privately-held, with the founders holding more than 90% of the share capital.

"The Company" has been honoured with several awards, both for their technological advances as well as their performance as a company.

As a source of information for describing what happens when students start companies, the narrative gives very little away in the sense of describing how it happened.

5.5.1 Founding "The Company"

When you arrive at the head-quarter of one of the first winners of Venture Cup, nothing gives away that this is a young company: only 12 years old, founded by graduate students while still at university. The HQ is situated in Copenhagen, across from other prominent companies. It could hardly be placed at a more prestigious address. There is no garage, attic or closed-basement shop, whichever corresponds to your idea about what a start-up looks like. This is no longer a start-up; it is a thriving business which has set the standard for products within two large industries. The outcome, a

successful business, was part of the goals of establishing this company; the other was a keen desire to work with the technology.

When you enter the hall of the old building, which used to be an old warehouse, and take the elevator up through the building in an elevator shaft built for hauling large amounts of goods, and not personnel in a small elevator cabin, nothing gives away that you are about to enter a head-quarter of a company creating cutting-edge high-tech products. Leaving the elevator, you make your way into the company offices centred around the huge open elevator shaft, so that through the windows you can see the other departments. You can also spot the founders' office, which is placed so that they can see everything and have access to both sides of the loop which creates the company office. As a matter of fact, the founders still share the office, situated right across the space occupied by the CEO whom they hired a couple of years after they started.

But how did they get here? How did they make this happen? Who and what helped them, drove them, made it irresistible to start a company? Did they share the same interest in technology? Was it a desire to become rich? Was it a need to own your own company? Was it because they had the "gene" and just couldn't help themselves? Was it simply because they were on the right spot at the right time? Was it because they had the right help to come up with a good plan?

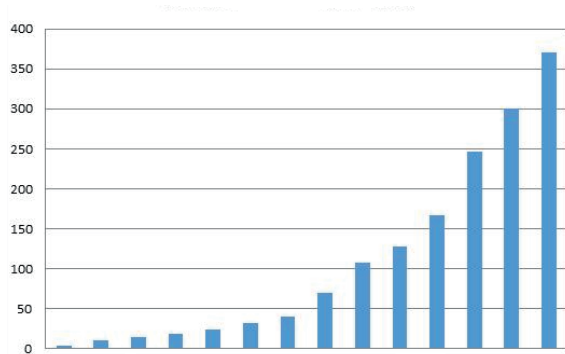


Figure 5.2: Growth rate of "The Company"

The questions one can raise are countless. The purpose of this chapter is essentially to describe how they did it. The narrative will be used to establish how the two students decided that they had to start this company, and how they made it live and thrive. So let us turn the dial back to 2000 and "hear" the story of the founding of "The Company".

In 1999, at the height of the IT-Bubble, Dan was a student at Copenhagen Business School, in his last year of his masters degree in finance, living a student life as most others, and participating in parties as most other students. However, a party is the turning point for this company. At CBS, Dan saw a poster advertising Venture Cup Oeresund, a competition for the best business plan. No one will know whether this poster was put up by a

young McKinsey consultant, Karsten Snedker or Tanver Sharif, but it was the origin of how "The Company" came into being.

As Dan puts it ³ : "so it was great when there was a competition then. There was this business plan competition. I was studying for my master in finance and luckily Poul was game for it and Poul has always been known in my circle as the clever engineer that could make things or the crazy engineer who was making fancy inventions – or wise and crazy, you may quote me on that. So, he was luckily game to participate in this Venture Cup, so it was like a starting signal" ⁴ But how did Poul get into the picture? Well, Dan knew Poul, as he says. He knew him as an engineer who made things. They had met at parties in a group of people to which they both belonged. As Dan puts it, when asked if he was just looking around for an idea or a technology: "Yes, yes – but no, I had then met Poul who had told me about it – so I think already relatively few minutes after I saw that there was a competition, — so I thought – firstly that I wanted to be in it, and then I thought what can I use. And that was how I thought, by golly, what Poul told me about at the Christmas party two months ago, it was so obvious." As stated above, there was no major or fancy master plan for the start of the process, just a desire to participate in this competition. In order to do so, Dan had to come up with an idea. During his studies, Poul had been doing some consulting work, dealing with IT-articles, etc. Somehow, he expected to continue being self-employed, without knowing in which areas of his previous ventures he should start a business. Still, the idea had occurred to him.

When the green light from Poul was achieved, a process of getting to know the product, or "the machine", started. Dan had "played" a lot with technology, and was technically inclined, but the first phase of the cooperation was to see if what Poul told him was actually true. This coincided with the first phase of Venture Cup, the idea description phase. He needed to check thoroughly whether the idea of "the machine", as proposed by Poul, was actually as unique as he claimed. Dan puts it this way: "Well, quite basic technology as we had then – I was of course extremely sceptical because – uh uh – I had no idea if I should take his word for it, if there was something revolutionary in it and the way – and there was – I think I spent many weeks sitting around the clock and googling "the machine". So every time I found a new one, I sent it to Poul and asked why is it that what you have done is better than this one and he always had a good answer – so he ... he's a good salesman."

³ at this point of time Venture Cup Oeresund advocated a close cooperation between the participating universities and their students.

⁴ All the interviews were held in Danish, so these excerpts are my own translation

Venture Cup had three phases. As previously mentioned, it was set up to help students through all the phases of creating a business plan for a company in order for them to avoid the most common mistakes and qualify the students to pursue a life as entrepreneurs with their new venture. At the end of the competition, it would even facilitate contact to venture capitalists.

This was not exactly what happened in the case of "The Company". Dan explains it: "well, but if nothing else, we participated in the competition. There were three phases, and it went quite well in the beginning or actually throughout, so - it gave us some confidence to continue or whatever you call it and while we went on with the competition, actually long before the contest was over, we said okay let's do it, not just as such a Venture Cup thing, but as a real company."

One of the first things they did was to add new employees: Christian and Daniel. Christian, an economist, was to work with Dan on the business plan and general business economic problems, whereas Daniel, who had just finished his Ph.D. was to help Poul develop the product.

The product they started out developing was nothing more than a laboratory test set-up, and their initial idea was to create a machine which could enhance presentations of products on web shops or do quality control.

But what attracts people to new industries and new start-ups? Asked directly, Christian, the economist who got hired in the initial phase, answers: "It's a good question. Actually I was on my way to I studied with Dan, and I tried to find a job in London in corporate finance. I read financing, and I was really not prepared for entrepreneurship. I was in the opposite lane where it was big companies, established with some exciting big projects that attracted me at the time. So when Dan asked me if I would help to write the business plan which they were writing for the competition in which they took part, I had to think fast. I thought the concept sounded very exciting. But already "the machine" was really okay, something that I had never heard of. So I tried to learn a little more about it, and I talked to Dan and Poul... I just joined that way. We had one project at a time, then there was the competition and we had to write different business plans, more detailed every time we went on in the competition.The context ... it all started a little formal because we had to think about the company. Also financing, also with planning and budgets, so it was very formal and it was perhaps what I felt safer, because there was a frame and I could feel that we had different skills but that is very complementary in that way. So it's just how I started. It was very ad hoc. It just came so, but it was not something I had planned with my life."

The people hired from the technical side have similar stories. Bent explained it as follows: "Me personally? Well, I was head-hunted by another employee. I was in a company which went bankrupt six months after I

stopped. But it had started already. I could feel it began to "creak" a little. It was that way in the dot.com days around 2000. You could tell that it began to give away a little. The numbers were perhaps a bit too optimistic. I started to look around. There was a colleague who joined "The Company" and asked if I wanted to. (I wanted to try). The first phase, it was like the driving force. Beyond that I thought it was an interesting and exciting technology, so it was personal relationships you can say. I'm not sure that I had applied if there had been a poster or something. I have only changed jobs with the help of people I have known in the different places."

Axel was a student when he joined "The Company". He was not looking for a permanent job, just a student job, but one which would let him get "lots of hours". He says: "my studies were going at full speed, but I wanted to try the real world and then there was a job posting in the computer science department, and it looked exciting. It was something with "a technology" and a "machine", and it seemed to me that it was really exciting technologically." He applied for the job. He got it and never left.

Bent recalls: "I thought of it mostly as an exciting adventure, as a fun place, lots of committed people who thought it was fun and exciting technology. Hmmm, well so, I was not so much ... , I had a reasonable ... – well it could be really fun to try. If we succeeded, we succeeded and if we failed, well then... I have never been one who had difficulty finding jobs. So I was rather ... – well, so the uncertainty was not something that worried me very much."

Inge had just received his Ph.D. degree when he was approached by one of the very first employees, Daniel, and he puts his reasoning like this: "I was called for an interview, and both the owners were there, and it was both owners who interviewed me. Hmm, I got a good impression of them. And I - Daniel by the way, I had great confidence in Daniel, so it was this way on both sides that they - they knew me through Daniel and I knew them or the company through Daniel." This makes it sound as if it is just a question of a personal relationship, which it was not. Inge notes that he would not have felt happy creating a software system like Damgaard Data ⁵ , but would find it very interesting to take part in a project, which he had heard of outside the company, building an apparatus for enhancing golf-swings. It would have the same technology, all the statistics and computing as "The Company". But there had to be an apparatus - a physical product. Therefore, technology, especially creating a highly complex machine capable of doing things was very important

When asked whether he would have set up a company if it had not been

⁵ Damgaard Data was founded by two brothers who developed an accounting and management system which was later sold to Microsoft for 11 billion DKK

for Venture Cup, Dan is quite blunt in his conclusion: “Then, it would not be sure that we were here today. Then we might have started something else, but it was certainly what brought me and Poul together and made us start something together.” The decision to do just that was reinforced by a couple of factors. Not only did the founders want to own their own company, but in hindsight they had considerations about it, and both founders saw advantages of doing it together with someone else. Dan stresses that he finds it important that they were two founders who came from different academic backgrounds since the combination of a commercial person and a technology-oriented individual strengthen the company: “When you want to make a technical product, then it is obviously not enough just to be myself, but I think you will see many examples of companies that are started by more than one founder. It is probably healthy that there are people with different backgrounds and with different views of things. One with a technical and commercial background is probably a good combination. But I must say that Poul is also quite commercial. He had had some small business before we started, as a hobby during his studies, as had I.”

5.5.2 Financial risk in setting up the new venture

The founders had obviously a much more direct relation to the financial risk. They had to fund their venture, and by doing so they also took a much larger financial risk if failure occurred. On the other hand, the spoils, so to say, were also theirs. But they did need to handle the risk. Dan explains it: “I really do think that in many ways it is easier for a student to pay for this lesson (the start of a company) than it is when you’re in a job. It may well be that the person who sits in a job already, how can you say it, has some savings. But on the other hand, the one who sits in a job may have some expenditures that require a regular income and when you come straight from the university, you are used to having no money. Then you can just continue. Well, no money in Denmark, you are relatively well off. You can get student grants. But then we went to the bank and borrowed for the start-up, that is for our respective private company we borrowed 100,000 DKK.⁶ So, no, I did not see a big risk.” Dan had to change bank in order to find one that would back him. The bank he had had from childhood did not want to, but there were others, so all he had to do was choose the bank with the best

⁶ In order to put 100.000 in perspective, in 2000 a VW Polo was around 160,000 DKK A Peugeot 206 130,000 DKK. A lot has happened to small car prices but it puts into perspective the amount in question. 20 Prince cigarettes were a bit less than 30 DKK, 19 cost 43 kroner today, which is in line with the development in buying power. In 2000, 100,000 dkr was the equivalent of 129,000 DKK today according to Danmarks Statistik (the Danish Census).

interest rates. The situation was pretty much the same for Poul. Dan added that they got a "Vækstkaution"⁷ – "it meant that we could borrow up to 5 million in addition, but we never used it in full because we were ... but it gave us an enormous calm. It meant that we were never "wow, what do we do about next month, we will run out of money", because we had the 5 mill DKK guaranteed overdraft which we could use if worst came to worst."

For the first employees the questions of risk takes on another dimension. It is not a question of risk in the sense of investing money – because they did not, but a risk in the sense that you may spend time on a start-up which career-wise led nowhere. If it failed totally, they might be without a job on top of having lost time in a corporate career race. Even though the first group of employees thought about it, they were still young and out to conquer the world.

Christian, who originally planned to be an investment banker in London, and hence was schooled in handling risks, characterizes his perception of risk in the following way: "In fact, not so much. I just thought that it was more interesting for me personally to be here and try it here. That I was willing to take the risk of it, but also because as I said we found applications for our technology very quickly, and one of the very core things for me, which has made a difference in our development is that instead of being a company that just develops "a machine" and tries to sell a little for all sorts of different applications... (we had a customer)." When discussing what his parents said when he informed them of this major career change, he just says that they had been used to him travelling a lot, and that they had always supported him in his adventures. Entrepreneurship was a popular subject. If not the subject of the hour then, due to the dot.com era, it was definitely not unfamiliar. For his girlfriend, who had just found a job, this change of plan was not altogether an inconvenience – and for a while her job helped finance his stay with the start-up. Christian sums it up: "I have travelled a lot and they (the family) were not particularly worried about it then. No, no, they thought it was exciting, and it was their opinion too, if you cannot do it when you're 25-26, then when should you try it?"

Inge had much the same approach. Just as Daniel, the first employee, when asked if he had any financial concerns about joining a new start-up Inge said "Nope. It was not (a subject). I got a salary from the start, which was ok. Maybe not quite ok, but nearly okay and... and then I thought that if - if it goes under, then I just have to find a new job, which was not difficult - it was good times - and I had many offers."

Bent, who came from another start-up which in his opinion was heading

⁷ Vækstkaution is a bond-like guarantee for a loan, offered by a state institution Vækstfonden, a foundation set up to help companies grow

for trouble, had much the same relaxed view when asked about the subject of financial deliberations: “Yeah, but of course I did, but it was not something that worried me very much then. The company I was in before was also... - in a way started in the same way. I just joined it a little bit later, but much in the same way and it went a little up and down and it ended with bankruptcy (after Bent left). So it was not anything. As long as I got my salary it was fine, and I was reasonable convinced ... Business was relatively good at the time so I could probably find something else if it happened.”

Axel, the young student, had no qualms. He was looking for a job to finance his studies, not for - as it turned out - a permanent position.

Today, the interviewees have high and well-paid positions with “The Company”. During the interview, Bent immediately made a comment on his prospects of branching out today. Unsolicited, he said: “if I would do it today? The same thing. Then I would probably be a little more careful. It was before I had children. There is something when you have children and house to be paid and other things and stuff. And I had fewer obligations then and the appetite for risk probably slightly larger. Today, I might be a little more cautious. Yeah, I guess so. But I think it could happen again, with something similar, and so to say that ... you have some money that you can sort of live on if something should happen.” Bent also refers to the fact that today he has a substantially larger network to help him than he had when he was a new graduate.

Would they do it again? This question was answered with unanimity by the founding team. Only if it was with a group. As to the financial aspect, they all now have reservations due to the fact that they have family today as well as houses and other fixed costs. Axel comes out strong and says: “No, I would not do it today. I have a family and lots of fixed expenses. Not today. I do not believe that I would jump on that wagon. Well, then I would have to have lots of capital in the bank. I was nr. 5 who started here, and there is a lot of risk in start-ups. They can just as easily go under during their first three to five years.” He goes on to question if he would do it, but the general consensus among the first recruits is that the chance that they would start again (and they are now in their mid- or late thirties) is very slim. The desire for a new adventure is there, but family responsibilities tend to make them very cautious about risking it all.

5.5.3 Founding team members importance

When the decision to start the company was made, the next step was to select the “staff” to handle the job. Dan and Poul had to so to say man up before they were sure what they were going to use the technology for. The only thing they knew was that “the machine” was the key to what they

were going to do, apply the technology and then it could be used for ?. Secondly, in order to attract capital, and continue in Venture Cup Oeresund, a business plan had to be prepared and perfected.

It has already been established that Dan and Poul knew each other but they were by no means close friends at the start of the company. They had some knowledge about each other, based on a few social functions. Christian was brought in to help Dan with the business plan endeavours, which were two-fold: not only to participate in Venture Cup Oeresund but also to secure investment from venture capitalists and oversee the finances for the now running company. Dan and Christian had had only one semester together when recruiting Daniel, who had just finished his Ph.D. Again, he was not a person known to the founders or their friends.

Axel, who joined the company as no. 5, states that he was recruited through a poster on DIKU⁸ : "I was a computer scientist, and they were all engineers and then there were two who were from business school, who took care of the economy and business and things like that. So I had a different background, at least academically." "The Company" had recently moved into the offices, where Axel was introduced to the technology - or rather a laboratory set-up showing its potential. There were a few tables and chairs, but to Axel the technology "looked so exciting - it was exciting technology, and I wanted to look into it. So you may say, I did not have my guards up, and they were open and needed some people to join them who were knowledgeable too." When Axel joined the company, it was as he remembers it, five-six months old. At that point of time, the group was small, but it was a group that worked very hard. "It was - it was the pace, I would say. It's something you have to think is fun, it is the continuous long hours, uh, that you are passionate about getting through and we were all very young and inexperienced work-wise, so there was no... - there were thoughts about leadership and organization, responsibilities. There was a business plan. Business-wise it's run very tight. One can say, from the start it's something which sets us apart from many of the others. A typical engineering start-up, is where it is technology which is exciting - and then hoping to find someone who can see whether it can be successful. Where as this was a partnership between an inventor type from DTU and one from CBS . From the start, we got an award for our business plans, and like all the time we have had focus on the economy in the company. The few people who were involved with it have been tough but fair. I think it's slightly in the DNA of the technologists to make technology and so they want as many users as possible. It's fine if something comes out of it, but you can, well, hardly allow yourself to take money for it. So there has been a good synergy in that, at least there was

⁸ DIKU is the Datalogical Institute at Copenhagen University

control over the economy. Then the rest of us have just stormed off with the technology and it worked fine in the beginning.”

Christian, who was a partner in the team working with the business plan, recalls that everyone was doing everything, and that apart from writing code, he did everything in this phase of the start-up: running machine covers to the painter for painting and picking them up again, shopping for lunch and preparing it. Bent was introduced into this chaos. He had been with Ericsson for a while, and in another start-up, which had been larger:

“Well, it seemed, I thought it was very chaotic in the beginning, because I came from, after all, a little more controlled conditions in many respects, also a place where there were some roles. There were some different expectations to the person who is the project manager. He does such and such. There was like, there were some department heads, there were some project managers. You have to say that when I joined ”The Company”, there were the owners and then there were all the others. Basically, there were no responsibilities or anything. It was clean, you worked on the task you worked on. Now and then you would probably figure out what the next one is going to be and it bothered me in the beginning.”

But everyone was involved in a very direct way. The dependency on each individual was larger and more profound when the team was smaller. No one could be replaced without it causing serious problems. Bent comments: “The downside is that so early on it is highly dependent on a few people. Of course, it will typically be like that when there are 10 of you. Then, you are very dependent on each employee. The idea is that today one can distribute knowledge to several people, so regardless of whoever is run over by a truck or something... well, then fortunately we have knowledge with some other people. And we do this as a part of our daily routine now. We do not have the lone heroes. But these heroes are necessary in the early stages. First of all, because of the commitment that is prevalent but also because you do not have the ability to spread R&D to a lot of people.”

This interdependence means few people working on one “large” project, knowing that what they do plays a significant role, and they are not just any employee among a lot of employees. Even though ”The Company” is not the largest of firms, its high growth rate causes concern in the founding team. The small size and agility of the team as well as the loyalty of its members towards one another were a significant strength, and are still seen as very important. Yet, when a company grows, it will eventually need more structure, and a division of employees into different fields, different products and industries. Bent has some reflections on this: “The in-house competition. I’m a little ambivalent about it. In a way, it’s fine - competition is a real driving force in many ways. On the other hand, it should not be so much that you begin to fight each other internally. For God’s sake, it must not hap-

pen in a company like this. In my opinion, we are far too small, and - so it must... For me, it is important that the spirit of cooperation is that we work together to make the best products. In good fun, we can tease each other that we have sold a few more of our products than your products. It is fine, but the basic attitude must still be that we have made a good company and good products. The focus must be on the company, and not on my product and my component." Which coincides nicely with Axel's reflection that the focus is better when funds are limited. Reflecting on the team, which has recently made a new and somewhat different type of a product, and asked if this team would benefit if placed for themselves, as was the case when starting "The Company", Bent says, "Well, it could be justified. You could say so, but I still believe, I still enjoy that primarily we are here to help each other and so create some products."

In the founding team, there was an over-representation of participants who had no other business background. A few had some. However, experience came into the organization only with the introduction of the CEO. In order to understand a small start-up, there are specific things you need to know and certain interdependencies which are critical. The founders had only had the experience they got from trying to run small companies e.g. selling computer parts, but none in running an organization. Only Bent and Inge had some experience. Bent had worked for two years with Ericsson, and then for two years with a somewhat larger start-up. Inge had been at Danfoss. One could say that this start-up was business as usual. Bent comments: "I liked the fact that there were great opportunities to try many things of which you actually, where you can find out what it is you really like, because what you do is so wide-ranging. It is typically not as a specialist, like when you're in a small company. It may be a few who are, but the vast majority will be forced, in one way or another, to be reasonably broad: as I mentioned ranging from sales, finance, technical development and possibly to try many different things, to see where it truly is that one has one's strengths and one's interests. I think it really is a pretty unique opportunity you have in a small business - and especially to have so relatively early in one's career. You may not quite know where you actually have your interests. I think it can be quite healthy. Then there is what we have mentioned a few times - it is the possibility to see the effect of the things you do extremely clearly. You learn some things that are harder to... that some relationships are more difficult to comprehend in a big company can suddenly be seen. You can see why this is important - because otherwise it can go terribly wrong. Those interdependencies are extremely clear in a small company."

Christian's experiences were from the management- and business-plan side. He experienced it in this way: "As I mentioned, in the beginning it

was very complimentary. But it is true that you do a bit of everything and so on, but there were some things that were definitely one's task, and the others were clearly the others' task. And clearly in the beginning, when we had what we had, we were ... there were just so many things. But we should primarily define some projects. If it was purely technological, then it was obviously Poul and Daniel, and the others - the administration and marketing and, of course, the business plan. We went on to write the business plan for maybe two years. At the beginning, it was Dan and me - and I was definitely called in to write the business plan. But it was also actually an exciting thing to do right out of school. You still have many principles and things and theories fresh in your head that you have to use, because there are some things you must check. The market, you have to really make sure that there is ... so it is very comprehensive and again, the theoretical background which I had and confronted a little more with a kind of reality. But it suited me just fine to write the business plan - right at that time."

With four people in the company and a difference in education, the division was only natural. But in contrast to doing it for fun, participation in Venture Cup was for real, and it was funded by Poul and Dan. No one remembers that it gave cause for problems. It was so to say a given that when it came to making the decisions, the ones who paid the piper called the tune. And this was accepted with no hard feelings. Poul, Axel and Bent describe dealing with technological problems as a situation where they met at the blackboard when something needed to be worked out. They discussed the possible solutions and made decisions. The technology people in the company tend to describe it as a search for the best solution. Christian adds a bit more flavour: "We have very... we are actually four people in the beginning, with very strong personalities. So there were always some heated discussions because we are all passionate about it. But I must admit that sometimes it was a little too much discussion. That is like, yes, you throw yourself in, maybe a little too personally, rather than come up with a solution, but yes, it was more ... again enthusiastic people who are really passionate about it." Christian explains that being French and having a more international background, he sees no paradox in a close cooperation among a few people who so to say helped Dan and Poul develop their company. As he puts it: "I think I also contributed something to it, the business, in a way. Because instead of it being a mere pure Danish Viking business, then there was a little Frenchman who helped to start it, and I think it was an advantage."

Reflecting on the group, Christian adds: "They (Poul and Dan) were very lucky again to find some really talented people to start with, and we still have (this type of people) today. Therefore, this is what I think. We still have the right loop which works very well, but we have got some real (good

people). So from the start, we had some people who could make their mark on our products too." The founders attracted talented people and let them influence the company and the products. Christian says about setting the course: "but regarding communication and cooperation between people, I think it was ... as I said it was Dan and Poul who set the course and made the final decisions, but everyone was allowed to contribute and it is so even today."

When asked if the fact that the work process was influenced by the group being students made it sophomoric, Christian's response was passionate: "No, it was not - it was the opposite. I would say it was for real. It was not a theoretical project, because that's what you think of ... I know it very well from business school. It has not always been so positive. This group work, it can really, really just be It was not so, at all. In this case where we were so busy making some important decisions on matters even though it might be strategically 10 years in the future. But still it was something that they (the group) could see a connection with today, so it was very real. But there were many discussions about what we should do, but it was real. It was not about what (theoretical) model we needed ... (pause)." Christian explains the situation and ends by stating that it was all in order to "primarily to proceed correctly, but again, it's more because it's very passionate people who are very forthright and also very straightforward too. So you can really say things as they are and "bam" – bluntly."

For the founding team, this phase was a mishmash of tasks which had to be handled: coding the software, building the prototype, researching patents, applying for patents, preparing marketing materials, doing marketing and whatever else a founding team needs to do to get the company off the ground. Christian recalls: "It really is where I believe that we are so atypical, in that we have not been dependent on capital - and it is so nice. It has given us so much freedom in the development of our product and the company's development. So it's honestly hard to copy as business experience (model) or experience because of the timing. Of course, there is talent and finding those niches that're part of what we have done. But yes, it is really something that is so unique and something I appreciate so much that is in this company." The spirit of the start-up, and the will to go ahead coupled with a confidence and belief that they could do it are present in all the interviews. In another and later context, Inge describes how Poul visited a supplier: "He visited a camera manufacturer, and so they were actually ... well, they were mortal like us, and they got the parts and put it together and how difficult can it be ... It is when you see someone do something that you do not know how to do. But they are engineers (like us) and then you think, how hard can it be? Then it becomes defused. It is just taking a leap." These leaps were facilitated by knowing that they had a customer. They knew what

they were planning to make so they had a reason to act. When they decided to make their own part, they were doing what they had been doing from the start. They could make the part exactly as they wanted it, and due to very minuscule price of the basic parts, they could add a lot of value to the product, both in the function but also as profit margin.

The group also had to handle differences in the educational background of their employees which included statisticians, experts in mathematical modelling, a computer scientist and of course, equally important, business school graduates. Still, although the gap had to be bridged, it does not seem to have been a problem: “It is quite clear, I always got picked upon. Argh, you’re just a commercial. We are the serious people here. It’s like ... well, you guys are just doing some marketing chit-chat. It’s just a recurring joke. I’m so used to it.” Christian goes on to stress it is just that – a joke. A mutual understanding exists in the company about the need for all capabilities, just as Axel explained the need for having a computer scientist join the team.

Seen from the founder’s perspective, Dan stresses that the first person recruited is willing to take the risk in a company without a track record. He describes the cooperation and the division of labour as follows: “You think about the start. Well, it worked brilliantly. There was like no ... - just because we had such a diverse educational background, there was no doubt about who should do what. It was a given that Christian and I, we should definitely not code anything or voice too much of an opinion as to how things should be implemented. We could have an opinion on what we should develop, perhaps what the product was intended for in the long term, but we were not supposed to be hands on in the development. And - the others, they would not write business plans, etc., so there was a sensible division of work.” When the goal was set, the team just had to sit down and program for twelve hours, as Axel put it, without wasting time on social activities. As Inge said, the technology and the application was what brought the group together. When asked if owning the company had an effect on the team, Dan replied: “Heck, I don’t know. I do not think that we have ever said that we decide because it is us who are the owners. But there has always been an understanding, maybe. So it may well be that the others may have stopped because they knew ..” All in all, the members of the founding team were people who knew their worth and who joined the company because they had capabilities the company needed.

Nearly two years after they started, the founders hired a CEO. Poul recalled that they needed someone to negotiate with the big corporations. He felt they got too emotionally involved. As he put it, they wanted to win, which is not a good approach to negotiation, so they needed someone with more experience. Both founders agree that titles, prestigious as they may be, have no real value. As Dan says: “Ultimately, we sit on the board. (...) Well,

it's about knowing one's own weaknesses - and one of our weaknesses has been our lack of experience within a business context - so we've never had the idea that we had to be the smartest at something. It is a sure non-starter if you hire people and think you are smarter than them. You should ideally hire someone who is smarter than you are to solve any given problem." In this start-up, both founders and employees stress that only people with the highest grade-average on their diplomas are hired. Inge described the effect in this way: "How we collaborated? I think it was ... it was extremely focused - a thing which was truly special compared to Danfos. It was that we hired on the basis of grades. We were completely grade-fixed, and we still very much are, but we do not employ people who do not have really high marks, like twelve on average, really, really high marks. And it was... and it was, and is quite a good filter. If you get the ones with the best grade-average from DTU, as it was, or university, then you can't go entirely wrong." The founders stress that they want employees with the best grade average, always have, and always will.

5.5.4 The Customer

The decision to start the company was made in the competition phase, where you would normally test the idea. However, the results were so promising that Dan and Poul decided to start the company instead of just moving on to phase two. They did not only start a company but they also hired people to work for them.

When the decision of founding the company had been made, the dire need for a paying customer became evident. The ideas as to the potential of "the machine" were plenty, since the technology was open for use in a lot of industries. The dot.com era was on in full bloom, so the desire to make a product which could benefit from this was evaluated. Ideas were researched, but the founders leaned more toward production quality control.

With a limited budget, they needed cash flow, and looked around for areas in which to apply their product. So they approached "The First Customer". This contact resulted in a cooperation on developing their product so that "The First Customer" could implement it. Not only did having a customer provide them with funding, but it also meant a strong focus on the product. The co-operation meant that the new venture came into a very close dialogue with the market/customer, and in this way secured that the company delivered what the market and the customer needed or wanted.

This bonus of having a customer order is accentuated by Dan in this way: "I believe that there are many people who are good at... now I wink my eye ... or are bad at sitting and imagining what customers want. And then they do a lot of development before they actually go out and see what

it actually is that the customer wants. I think that's our strength, that we understand ... Today, we stick to having a beta-alpha customer panel, and we continuously go around the globe to visit and ask about what is important to them, and then we use our own logical sense to look at what's going on." Having a customer focuses the development process. There is less room for getting lost in the world of technology, and all the fancy things that technology can be used for. Bent says about this subject: "Well, there has almost always been a big customer involved from the start. We have had a project in quality control where there has not been an actual customer. It was a project that was partially funded by outsiders. You could say there was funding behind it when we started, but there was not an actual customer, and it has also proven to be a problem. We have actually had a hard time selling it." According to Bent, the problem they encountered selling the product could be explained as follows: "To have a customer on board from the start has been extremely effective and we have also done it almost every time because you just have that ... If there is a customer who actually believes that they can use it Most of us, technologists, we are great at technology but we do not know a lot about the industries (with which we work). We learn of course, but we do not know terribly much about the industries we move into before (we do). We build knowledge and it is built. It just takes a long time. It takes years before one becomes an expert." The importance of staying focused is addressed by Axel: "Business-wise, you should not have too much money. I still believe that". When questioned if too much funding makes you not necessarily lazy, but content or secure and more willing to stay with an interesting problem which may be of no use to a potential customer, Axel answers: "You do not focus enough on customers because you just develop further because you get your money."

Last but not least, a customer influences your product in a direction you may not have seen yourself. Dan explained that a lot of areas were analyzed while exploring ideas for where to go with the venture. In the dot.com days, it seemed so obvious that they needed to come up with an application for the market. They felt that the area where they could really make a difference would be to use the technology for quality control. Even so, the customer who gave them their first order made them go from quality control to the very beginning of the production process. Instead of assessing if the final product had the quality required, they were asked to use their technology to produce the product, since the customer found that they would be better suited for it.

5.5.4.1 "The First Customer"

In the introduction to this chapter, the importance of having customer involvement was emphasized. Therefore, the effect of "The First Customer" should not be underestimated. The story behind getting "The First Customer" is close to mythical in the company. Some of the employees see it as a very deliberate action, whereas the founders recall it as a somewhat more accidental process ending up with "The First Customer". Outside the company, that is in Venture Cup, one of the McKinsey people recalled it as something he may have facilitated, because he worked for "The First Customer". As John F. Kennedy phrased it "Victory has many fathers, failure is an orphan." We may never know how this would have played out, if the idea had come from someone else. In the following, the different takes on the story will be presented, starting with Dan, who tells the story as one of the founders.

Dan recalls that they found the first customer in the following way: "... but if nothing else, we participated in the competition and it ... There were three phases, and it went quite well in the beginning, or throughout. So, it gave us some confidence to continue or whatever you call it, and then at the same time as we started to make that is long before the competition was finished, we said right, let us do this, not just as such a Venture Cup thing, but as a real business. So we started relatively soon to look for some genuine customers who would actually pay for that totally unfinished product, as it was at that time. It was not even what you would call a prototype, it was a laboratory set-up or what I think would you like to have me explain a little? (goes on) So, we started to make calls to potential customers from the start. You can use "the machine" for almost anything. Initially, we thought about something like quality control in the industry where you could do quality control. We talked, just before the dot.com bubble burst, we also thought about something with web-shopping - you make a better product presentation if you want to sell on eBay ... You got a smarter presentation of the product, and it would be easier to visualize what you wanted to sell. So it was like two options, and a third was a medical application. So luckily, we came in contact with some companies (from the first customer's industry) really only to sell them on the quality thinking so that you could test and see if their products meet the specifications. But when we began discussion with them and we found out that it could be better if we could take a step further - instead of just quality control of the finished product, we could make a product or a production process, instead of testing the finished product (they could start the process with the same technology), and then you could build the entire production process around the fact that you have an accurate representation (of how the final product should be) in the

computer and we pitched the idea to "The First Customer"⁹, who is one of the major manufacturers in Denmark and they are very entrepreneurial by nature, I think, family-owned with a strong entrepreneurial gene and very technically-minded owners. So they found that it might be interesting to bet on such a totally untested sheet as us. I do not think necessarily that others would have done it, but they were relatively interested when they saw "the machine". But then we got "The First Customer" convinced, and we were to do a development project with them where we got some money and could hire some people, even though we had not handed in our final report for our masters degree. And it was actually a lot of money we got, although with some milestones, they still had the option to jump ship if we kind of did not deliver."

When asked to reflect from the student perspective on the size of the amount, 7,000,000 DKK, Dan says:

"Yes, I thought it was a lot of money as well. Then, I should just say that before we actually got a commitment from "The First Customer" we had actually hired the first two employees, because we believed so much in it (the company) at the time, even though it was on SU¹⁰ loans and we actually borrowed money to pay their salaries right at the start, so ... so we had taken the gamble that we would get this contract. And fortunately, we did so, 6 months later - after we had been founded - so it was quite the fledgling days and the first staff was another cand. merc. and a Ph.D. from DTU - so half of the company were developers and half were commercial."

Christian, who was one of the two people hired before they had the agreement with "The First Customer", recalls it as: "That is what we did immediately, (finding a customer) finding the industry, that is the partner who really needed the technology and in particular, a company - and again, some luck but also timing, because they had a patent on the technology for production of their products, so they had a huge interest in finding a "technology" which could work with it, because subsequently they could return to their partners or competitors and say that now we have a patent for it." The interaction with the company is so close that the story of "The Company" and "The First Customer" get intertwined, and in Christian's narrative it is hard to distinguish who is who: "We had found an area of focus and then because of this focus area, they ("The First Customer") could also see "the machine". But there was so much more we had to develop to have a production system. We were thinking production systems early on. And I think that it is a really big part of our success that we did not only focus on a technology but we were more concerned about the whole

⁹ "The First Customer" is a privately-owned company, large for Danish industry

¹⁰ SU is a loan for financing your studies, guaranteed by the state

production line and the entire production system. We did that from the start with that company, and so we also had a smart deal with them. We gave them different options of the contract." When negotiating the deal with "The First Customer", it was important that it did not end up with "The Company" supplying a consultancy job – developing the technology and hardware, and leaving the Intellectual Property Rights (IPR) to "The First Customer". They wanted to own the IPR themselves. They made a variety of options for "The First Customer" to choose from, but finally, "The First Customer" let "The Company" keep the Intellectual Property Rights, and a deal was struck where "The First Customer" invested money in the development of the product, but did not own the ensuing patents. Christian added: "So everyone was happy. It also meant that our funding fell into place very quickly. And very cheaply. It is also quite atypical as it means that we continued talking with investors from the start, and it was obviously from Venture Cup (the purpose). And it was of course the whole purpose of it, and of course, it was in 2000 so everything was going up and people were willing to throw money at everything and dot.com and blah, blah, blah. But because we got the agreement in place we never needed the money or investors." "The First Customer" was brought on board, not as a partner in the sense of owning any parts of the company or property rights, but still they played a central role in developing the "the machine" – and the company.

Axel was hired when the deal was struck – and he tells the story somewhat differently: "When I started – what gave such a great lift - it was well, the business plan was that we would like to get hold of a company in "a certain industry" in Denmark, where we are rather large in that "industry". Then there were some people who said, "we believe in these young people". We had a prototype and "researchers" from DTU (who had proven) that we could handle small items with high precision, and we believed we could create the software and design their product, and we could help them get started to produce on that basis. There was a commitment, and pay at milestones (or stage-gates) along the way, so we got it. They gave us some money up front, and then we started to make it. They always knew how it went, and at each milestone they could say, we do not go on to the next milestone, so it was (for them) an inexpensive development process to engage in. I think that is why they came on board. It was a lot of money for us, but they ("The Company") could go out and hire someone like me, and suddenly we were not the three or four people. Now we were five – six – seven. We could pay wages and then get on with the next milestone and next milestone as we earned more and more money. It really brightened up when we could get other customers from that industry, but it was one of the things (the right to keep the patents). Yes, because otherwise, it was just consulting work and that is what we do not do. If the customer said they would not continue,

then it would be over. But in the beginning we only had one customer, so we would have to go out and find some other (customer). So it was a question of how many months we had. Luckily, pretty early on we were able to look a few years ahead. Even if our biggest customer should disappear, then we could survive for a couple of years. Then we would have to go and find a new one.” The influence of the customer is somewhat more distant when Inge talks about it, though it is still a question of delivering on deadlines, on which he says: “We were just three who did ”the machine”. We were not that many. Yes, there were some late nights. We always had problems with all the exhibitions. We always worked hard towards deadlines, and it was ... It was just Daniel who had a family, there was scarcely anyone else who had family ... As you work ... you had more flexibility in working time in the beginning. There were several evenings where we sat until late before it worked ... but it was not ... in the beginning. There was very much focus on functionality to the customer, and there still is, but it was extreme in those days, and not so much the right solution seen purely from the conceptual point of view. It was much more the value for the customer, what creates the most value for the customer for least work effort - it was always the line that was used.”

For Bent, the situation was somewhat different Even though he is one of the “old-timers”, his situation was different as early on, they started a new project with a new customer: “Now, I was actually not very much involved in just that project (“The First Customer”). I made a few things, but I was more within our other project. That was what I was made responsible for, reasonably fast, getting it finished, so I got my own project. Pretty quickly, perhaps a month, I had a few employees and raced ahead. It suited me fine as I could use the experience I had from the past for how to run a project, how it should be done (in contrast to his last job).” The customer they worked with on that project was “The Second Customer”, who will be described in the following chapter.

5.5.4.2 “The Second Customer”

Whereas the customer had a very clear role in the development of the first machine, and “The First Customer” had a lot to gain from the success of the project, this does not seem to be the case with the second client. Bent tells about the project: “Yes, it was ”The Second Customer” that we were cooperating with, and who was already a customer and bought another product. One of the products which unfortunately does not do really well. We still have it and are still developing it, but it was not a huge success and ... uh ... this is due to several things. It is a difficult market to get into, an industry which is very conservative, which does things the way they usually do it - like

the original craftsmen, who like the handicraft, and to get that into a computing solution, which they were very sceptical of. It may begin to pick up speed now. There's a little more acceptance and you get used to it but the speed is quite different than we see in (our new business area) and (what we did for the "the First Customer") which anyway, (as industries) are accustomed to technology in a different way - it may be one reason." The technology they developed works, you can use the machine. Trying to explain the lack of success, Bent addresses a key factor in the company: "something that's basically different when it comes to (this industry) and the other applications. There is a common term for the things we do. It is mass customization. It is the idea that you make a... well, you have a factory which mass-produces something but what comes out are different and individual things and it's really smart with (some products). But for (this product) there is not a very big market for custom-made (products). A few are being sold, but it's very very few, because they cost (a lot). It is more that most are willing to pay. When it comes to certain products, you want to pay the amount. But you could say that it is in this case. It is after all a very small market compared to the other market (The First Customer), so it is part of the explanation." The willingness to pay (a lot) for a the product is apparently not there. The problem is not that "the machine" cannot do the job. The issue is that the industries are not able to come up with a manufacturing system which can use the information in a cost-efficient way. The rationale for "The Second Customer" was that they wanted the capability to do so. According to Bent, "It could happen that it takes off again, at the time. "The Second Customer" and many other manufacturers had a vision to spread this out to the mass-market, but at a reasonable price. It may be you can get a standard products for a fraction of the cost. If you want something which is perfect, then you might pay the double. The belief is that there will be people who are willing to pay for it." The recipe was the same: get a partnership with someone in the industry. "The Second Customer" is a high-volume manufacturer and a worldwide company. At the same time, they were and are a large player. Still, even a large player in an industry which is not ready to make customized products cannot benefit from a new technology unless it either saves them money, which was the rationale in the first case, or it has so many benefits that the customer will pay for it. So far, this has not been the case for "The Second Customer".

5.5.5 The technology – and "the machine"

It has been described how the company was founded, and who were the first employees that were recruited. In this chapter, we shall look more at the impact of the technology, and the machine, while keeping in mind that this

was not another dot.com venture, where success was guaranteed as long as it was on the web. That era of high-flying ideas, when only a bright idea was needed instead of a product, was best shown in the documentary following GovWorks (Kuemmerle 2002)(German 2005), a start-up which raised an incredible amount of money but never actually made a working product. In the process, the friends who started it ended up bitter enemies while the friend who got bought out was the lucky one. It took less than two years to go from rags to riches – and back. Everything was about new economy, an example of which was: “Stig Leschley, son of SmithKline Beecham’s former chief executive, Jan Leschly, founded in late 1998, the Boston-based Internet bookstore Exchange.com. After only seven months, it was bought by giant Amazon.com for about \$ 200 million” In the climate of dot.com wonders and fast fortunes, the group was not driven by the web. In those days, where fortunes were made, and wasted, a technology-and-machine approach must have seemed a bit old-school. The following passage tells the story about the role the technology and the physical machine in “The Company”.

It is no surprise that for Poul, the technology was a driver. It was the subject of his master’s thesis. His interest in it was academic in nature, but also he wanted to work with it. Both the technology and the applications into which it could be brought fascinated him. As Dan described the process of taking part in the idea phase of Venture Cup, Poul’s idea had to be tested. But what if Poul had come up with another technology? Would Dan have jumped on the idea? Dan starts out by saying: “Well, quite basic technology as we had then, that of course I was extremely sceptical about because... hmm... I had no idea if I should take his word for it, that there was something revolutionary in it. I think I spent many weeks sitting around the clock and trying to google ”the machine” and its technology. So every time I found a new one, I sent it to Poul and asked what it is you have done better than this one. And darned, he always had some good answers, so he - he’s a good salesman.” Later, Dan is less hesitant about the technology. He remembers that as a kid he thought he wanted to be a 3D animator, and as he says: “Yes, I have sat with 3D programs, and programmed and designed in 7th or 8th grade, and thought it was very exciting and did not know whether I should be an engineer or study at a business school or what I should choose.” Even for Dan, who was majoring in finance, the technology was a profound influence. When reflecting about the people he worked with and is working with, he says: “Yes, you have to make some products that are innovative ... I will not ... I do not think there is anyone here who would be interested in making some ... or reverse engineering of an existing product. If we must take ideas from competitors, it has to be because we want to make them even better, and make the best ”machine” or the world’s best software - whatever it is.” When asked if he would have found it as interesting to make

a software platform for trading on the stock exchange, he first agrees – then reverts to their own technology. Somehow, the talk between Dan and Poul at parties seems to have been more than just an interesting chat, but rooted in a common interest in technology.

If you can attract a Ph.D. graduate, with just a lab demo of your equipment and a financing based on what money two students can borrow, the technology must have been interesting. But was it the case for Christian, who at the time of recruitment was planning a life as a merchant banker in the City of London? He comes from a family where both his father and his brothers were engineers. It is not that technology was not around, it was just that he had never been that interested. Still, now he reflects on the fact that "the technology" was: "Yes, it was new, it was exciting, it was futuristic, so it was important. Yes, totally. Yes, it was super important. It was not because I was scared of technology, but I knew nothing about it. I was never exposed to it. Earlier in my life - I have brothers who are engineers and who like to tinker with things - but it's not just something that interested me in the same way as it did others. I could not figure out how to re-use some theoretical things that I was told in school without understanding what they were used for, and then all of a sudden it was just okay." This initial interest in technology evolves over the course of the development of "The Company". But in the summer of 2000, Christian was writing his master's thesis, and the subject had a connection with the times: price setting of the value of dot.com companies. His master's degree in finance gave him quite an insight into these "bubble" companies, which one day were golden investments, even though they had no proven track record, and a few months later they did not exist. No matter what financial models and theories were used, the results were so to say inconclusive, or rather not in alignment with financial reality. Christian got a rather good insight into what the new economy was all about, and a good insight into technology. He also spotted something which was real, and not just a "bubble": "But it is just to say that I had a sense of new technology. I think nevertheless that it's not like the new messiah that came to save us all with the Internet, it is... you must have a good foundation, good basic principles and such things, some of the things we have got in "The Company"." When confronted with a question if he would have joined any start-up, he was also asked to reflect on a possibility to help someone who wants to make a draft beer machine (the new draft beer machine has six taps and is able to fill 6/2 liter beer glasses in six seconds or a pint per second). Christian started out saying that yes, it could be interesting but ended up concluding that it would seem a bit too limited with respect to technology: "The technology field is perhaps a little too limited for me in relation to IT. That is where we are now with "the technology". It is clear what we can do and have done. It started with "the machine" and

we have just developed the entire production system. When people buy our technology, it completely changes the way they do things, so I think that is important.” When asked if the technology has to be a bit “sexy”, the answer is: “Yes, a bit sexy in a way that there must be a potential so that it can develop. It must have a small core that can develop in different directions, so I think – yes, for me it has to be something flexible, something ... so it must be IT or software, that is, what I think, more than hardware”. The reason for IT is based on some reflections that general manufacturing has simply become too labour-cost expensive in high-salary areas. In order to survive, there has to be more of a technological input into the product. Otherwise, you cannot make it. .

For Axel, the motivation was the desire to have a relevant job while finishing his studies in computer science. He tells the story like this: “I was not tired of studying. I was going full speed, but I wanted to try the real world and there was a job posting in the computer science department, and it looked exciting. It was about ”the machine” and things like graphics and I thought it was a really interesting technology.” The description fitted his interest and the job offered real experience. He describes the hiring process in the following way: “There was a notice and then there was an interview and it was on some premises they had just moved into the previous week. There were some tables, and they showed me some things ... and it looked as exciting ... it was exciting technology and I wanted to get involved ... so it has to be said, I did not have my guards up and they were open and needed some people, who were smart, so!” As Axel stresses it, he was a student and ran no risk. He just wanted to work with interesting technology, in a company where he could put his knowledge to work, and make some money.

Bent had tried another start up, and was about to leave it because he felt that they were losing momentum, so he was looking for a new job. Bent was brought into ”The Company” by an old colleague, who asked if he would like to join them. When asked what attracted him to the company, if it was because the company was doing something good with their product, something which was reputable and admirable, as producing medicine - like Novo, he says: “Of course, it may be true... but it’s not that ... I think it’s part of it, it is nice to help people. It is a bit Novo-like. You have the idea that you will help someone to feel better, right. I definitely think so, but what primarily drives people, I think, is still the technology. Because it is an exciting technology... it is, and it is what really makes people tick.” When asked again if it meant anything that they were making a very socially acceptable product, he follows up by saying: “It is certainly a good thing that it is a noble purpose, but it is technology that it is our driving force.” The people interested in this type of technology, which involves statistics, math, etc. have other venues to pursue. Yet, as Bent puts it: “But many of the

people we have, the only other area they can apply for jobs within, if you are interested in "the technology", is computer games and there are, of course, some who think that it is really fun to play and develop, but it is just a tough industry in a completely different way. There are long hours, low pay, with very big uncertainty because it is very much up and down in that industry." The fascination with "the technology" is apparently also a fascination with everything that goes into making "the technology" work. According to Bent, "development which I am mostly involved in, it is the technology, it's people who are trained in this area and they want an opportunity to use it. And perhaps that is what makes us so special: I think, I think that (here we are) actually allowed to use it (skills) in many areas. It may well be that you study engineering for many years to learn a lot of maths and physics and everything, but in reality most are not allowed to use a lot of it. This is actually a place where one uses advanced mathematics, advanced statistics, every bit of computer science at a very high level and I am sure it is something that drives many. They can actually be allowed that. Unlike many others - it can be a bank where you have to add some numbers together here and there, but in reality there may in fact not be many who get to sit and grapple with the advanced formulas." When asked if he could work anywhere, he says: "I am someone who has programmed since I was 10 and since the first Commodore 64 came on the market, almost so. Technology and exciting products and things like that are definitely something that attracts me. It clearly cannot be anything (that I could work with). I would have great difficulty seeking a job in a bank." In a lot of the interviews, banks played the role of the villain or the antagonist in the story, so Bent is asked why – and replies: "Well, because it is almost always banks that take our employees... once in a while... I would say it may well be that it is a good company (a bank)... but I like to make things. There must be some product, something to come out of it, I think it's a cool product. It's something that really is, it's been fun to make, it's fantastic that it can be done." The fact that there has to be physical product is stressed further: "There are really many things that might, on the surface, look a bit dull but that are really super exciting when you get into it. But to be able to find "it" in it and see it very clearly, it is crucial for me. I would die in a place where it was straightforward. That is, if it was in pure management, management where there was no product, something I helped to develop ... I would have a hard time doing that." When asked about the importance of producing a tangible product, he replies: "Absolutely. And I think you are right, it has, for many with this background: engineers and those with technical training from universities - that you help to make one or another product. I think it means a lot".

Inge had just finished his Ph.D. During his studies, he had worked in association with Danfos, and he had serious discussions with a Swedish com-

pany (Inge comes from Sweden) about a job. Before choosing the job, he faced a dilemma because of the technology, and also because of the type of industry which was involved. Inge has previously described his considerations related to joining a start-up, and now he is reflecting on a job he was offered just as he decided to join "The Company", and a project regarding golf that he had just heard of. When reflecting on the importance of where to apply your knowledge, he says: "Yes, yes ... I got a ... when I was looking for a job after Danfos, I got a job in Sweden with a high salary and all the trimmings where I ... where my job was to make torpedoes. It seemed to me, it was not that funny. I did not want to make a torpedo. It's a great art to control them, there would be hundreds of microphones and you really had to manage this torpedo in order to hit a ship ... I did not think it was such a cool product, so I have deliberately not chosen them." When asked if the industry they were working for was better than golf, he says: "I would have no problem working with golf, but to make weapons ... I did not want to do that. Whether it's golf, or Danfos, it makes no difference. But I did not want to use my creativity to make the world's best torpedo." There is no altruism behind this, other than a choice of not wanting to destroy the world. It is not a question of saving the world. The technology is important in the sense that it is interesting and so to say does not destroy the world. Inge is focused on the fact that the technology is exciting. The importance of the era of dot.com ventures – and people selling their IT companies for exorbitant amounts is addressed in the following: "As long as the technology is cool. I had a discussion at the beginning. There was... what is it called ... it was sold to Microsoft. Damgaard, he sold his entire administration software to Microsoft for lots of money, so it was like everyone's dream. And I said I did not want it because it is such a boring product, a management system. To me the technology to create a management system is just ... it's not particularly creative." When the dialogue touches upon usability of the program and the ease of interface, Inge goes on and says: "Yes, but I couldn't be bothered to make the product. I do not ... it does nothing for me. I couldn't see the technicalities and I could not see where it was difficult to make, perhaps because I'm not "inside it". But I could not see it. In my opinion, the technology is not very exciting, so I'd rather not make that product, I did not want to do ... but I will do something with machines, I want to make something like a golf radar or a self-propelled vacuum-cleaner"(...) "yes, a physical gizmo. I think that's something, I can say I have made that."

5.5.6 Developing "the machine"

Chapter 5.3.4 explored the issue of the customer, whereas chapter 5.3.5 illuminated the importance of the technology in attracting the founding team.

The following chapter will look into what the team recalls about building "the machine", both the hardware and the software.

The input which Dan and Christian could give in this phase of product development was addressed in chapter 5.3.3. where Dan says: "You think about the start - well, it worked brilliantly. There was like no ... just because we had such diverse educational backgrounds, there was no doubt about who should do what. It was a given that Christian and I should definitely not code anything or voice too much of an opinion as to how things should be implemented. We could have an opinion on what we should develop, perhaps what the product was intended for in the long term, but we were not ... we were supposed to be hands on in the development. And the others, they would not write business plans etc. so there was a sensible division of work." Even though Dan does not remember taking part, Bent has a different opinion. He recalls it being a bit more nuanced: "Yes, there was not ... yes, maybe Christian did not, but then he contributed in other ways with some ideas and stuff. Christian and Dan and the CEO were the only ones who had no formal technical training, but they contributed a lot anyway and Dan still does with ideas or testing it out or suggesting what we can do instead. So basically, everyone was involved in it at the time."

Axel recalls the time when he joined as very productive: "The speed was so fast that there was virtually no plan. It was just full speed ahead. There was a priority. The things we do right now, they are the ones that are most important. And then you start doing it. There was not anyone who asked how long it takes, or when you will be done. We just did it. And then you would sit there for 10 hours a day and work hard and everyone talked, and then we'd go and show it to the customer twice a week - now we have come so far ... now we have come so far."

Poul recollects the development as hard work where everyone did their part, and if there were any problems, they were solved at the blackboard. Bent has the same recollection: "Well, if we speak about back in 2001 or something like that ... hmmm, big decisions. Major decisions, like, now do we have to do something else? It was Poul and Dan, clearly. Poul travelled around a lot then and came back from a customer or a trip - now we must do something in a completely different way. I have found out it is so and so. That is what is happening in the market and that is what they really want. Okay, we stop what we are doing and then we do it in another way. It was like that, that the really big decisions were made." Bent recalls dealing with decisions on how to solve a problem as "collaborative conversation, you can say, when you talk a little more specifically about the product. What it should be like or how it could be made smarter or something. We gathered around the blackboard and then discussed, and whoever had a good argument (won)." It is not winning for the sake of winning. It is not personal.

The better argument is chosen as a foundation for how to continue. Poul recalls this open attitude to everyone pitching in. Also Bent values it: “There were some discussions about different things, but on an equal footing. And today it is still very much the spirit that we just gather some people – hey, come in, there are some things we just have to discuss. And then we stand at the blackboard and discuss and find a good solution. Yes, it is, it is very much the way decisions are taken. And it is also a way I like to make decisions, I do not like it when... it may well be that I sit and think a lot about things or one thing or another, but I like... I prefer the way where I get hold of some people who have an interest in or knowledge of the area and then four, five around a blackboard and discuss it for an hour or whatever it is. And then I make a decision based on that. It is the way I like to make decisions and it is both for inspiration and different outlooks on it and often things and angles you haven’t thought of. But it is also something that includes everyone in the decision one way or another. It is not these dictates which do not work so well in practice”. The practice of yesteryear, with a small group of people, is still in some ways implemented today. But some of the agility seems to have evaporated a bit. “Yes, it went faster then, I would say. But, of course, it was probably some of the same. There are decision you can’t make just so ... some decisions can be difficult because you have no facts. If I choose this, this is going to happen. If I choose that, that is going to happen. It is very much a matter of faith, where you have to found it on logical things and studies. It can be one or the other but it is also very much, as it is with many decisions, a gut feeling. It feels right to go this way and if it feels right for many people in a group then it is most probably not totally wrong.” This open-type co-operation is commented upon by Dan: “Well, I remember it as if ... of course there were conflicts, there always are. It was not that someone who was ... it was not show-stopper conflicts or that someone left us in anger or so. I think that discussions and disagreements about how to do things, it just means that there were several approaches to problem solutions on the table.” The fact that they knew very early that they had to come up with a production line, and database system which could manage the individual items in the production, meant also that the goal was clear. It was never questioned what they had to build, only how they were going to solve the problem. But Dan reflects that the founding team were very self- assured, and fully capable of letting their point of view be heard: “If we did one thing or the other because of some discussion or disagreement, I think that we had the advantage. The goals were reasonably clear. Where we were going with the product, there were those deadlines, and we knew that we had to make this ”machine” and we had to make a cad software. And then, after the first development project, then came the next phase. With ”The First Customer”, we were to make an entire production

management platform, database management stuff, so you could see where which products or which items were in the production. So it was reasonably clear where we were going and what the development was. And the rest was more discussions I had with Christian about the business plan and investors, etc."

Inge, who joined the company on Daniels' recommendation, (Daniel was one of the original four) recalls it like this: "We shared our understanding of what the customer needed, and they gave us development tasks which we then had to do. It was pretty .. there was never any major discussion about what we had to develop. We divided up the tasks instead. We talked about what we had to do and so we sat down and we made it. More or less, there was not... it was great we were playing the ball. Just this big customer whom we had in the beginning. What does the customer need right here and now, what is the most important thing next week or in next 14 days? So, the development was not... we had, of course ... I feel we did not have huge strategic considerations, we were very focused on the task for the customer, to proceed and get to next step (milestone)." The decision regarding who did what was very much based on qualifications and, as it was a small group, who could help: "I got the tasks that, I think we can say were most relevant to me. The tasks that I ... it was making "the machine". And I was not so much into software at the beginning, but I was very focused on getting "the machine" working really well. And it was, well basically, I got the tasks, probably because of my background in statistics - how do you, how to optimize, so that you get a higher accuracy. It was my job, but otherwise it was that we were a group of three. It was Daniel, he was probably the project manager for "the machine" at that time, and then it was me, and it was Ken. We had been three if I remember correctly, yes, who sat and did "the machine" and we just had to get it to work - as soon as possible." However, if something happened everyone regrouped, and the three who worked on "the machine" would then help out wherever needed. Inge explains it like this: "But we had nothing in the way of a formal organisation. In an early example, if it was important to get the software to work – then we closed "the machine" development and we joined software and wrote software codes. And then later, there were software people who built "the machine". When there were many customers then Daniel, Ken and I, we went and visited customers, so we did almost everything. We did not ... we did not have formal divisions of our profession (education), we were all "Polytechnics" and were able to do software and mechanics."

But the people in the process are also very important to Inge, who addresses it as: "Yes, but it was... in a way it was exceptional. Smart people, there were some really, really sharp people in "The Company". I've never seen group work in schools where there has been a group of so many stars

at once. So it was – in that way, it was really wonderful.” Inge describes the small group of the three who worked on ”the machine” as: “I would not call it *prima donnas*, but we were the three guys who were very professional, and argued our things. But we could also accept if others had better arguments, so there were discussions on the professional level. And we agreed ... we have always been ... if there was a better solution, and it was not your own , then that meant accepting it. But we were able to argue for it and show whether it was better, and often we had a further development if we did not know what was best, and then we accepted the best solution as it was. We ... regarding technical solutions, it was never that we should do it that way technically. It was more commercially-based, which way we decided to go”.

It was a small group. Only one of them, Daniel, had a family. It gave the flexibility to stay late, and work until the problem was solved and the deadline was reached. When asked to characterize the first year, Inge says: “It was not particularly conflicted. I was delighted to get to work. I thought it was great fun. What I would characterize it as, was that it was a group of people that really ... who were all at a very high level professionally. It was great that way because you got ... you got really qualified opponents. You really got a momentum because we had great respect for each other. Also, as it was such a small group, we all knew what we were doing. When sitting, three guys working on the same product, then you know ... then you know exactly what you are doing. If you are five, six, seven guys, then you start ... it’s not ... When you are three guys with three tables next to each other, then you have a complete idea. You know what everyone is doing because we are working on the same thing. And it was also very easy to make a cooperation when one is in such a small group.” Inge says that people were recruited solely on their grade average. When challenged that grades reflect your ability to “go to school”, he replies: “Yes, and they are also good at solving problems, technical problems. And it was ... and it was also a freedom here that we did not have much thought as to whether it was social interaction. It was obviously a little social, but it was very focused on grades. It meant that we got a very special group of people at the beginning and we still have it.”

5.5.7 Motivation

One of the most important things to look at in the process of entrepreneurship may be motivation. If as the song says, “money makes the world go around”, it would seem that that is true, but only as a mean, not a goal in itself. Starting from the founders – who may or may not have had the goal to be wealthy – but much more, they just couldn’t help themselves, they could use a paraphrased mountaineering phrase “because it is possible,” , or rather

“because it could be possible”, it would be so easy if the explanation was, I want to be rich!!! As can be seen in chapter 5.2.1 when founding "The Company" no one – neither the owners nor the founding team has as a priority to become rich – or get a high salary. The closest we get is when the founder Dan says that today they have a fairly good company with a solid profit.

What was it that motivated people – Dan suggests the technology “yes possibly it was certainly the technology which attracted surely, it’s sexier to make the "the machine" than to sit and program accounting software or make web banking for Danske Bank ¹¹ or do something completely isolated at Nokia – a protocol for one or another mobile phone that may or may not get on the market, I think - I think there were many who wanted to work here because of the technology.”

For Axel, who was still at university when he joined the company, it was the technology. Yet, it was also more, something he feels he misses today: “What I miss - nothing really. I miss the fighting. It was fun back then, when we had competitors that we really fought with, and we won, so it was a nice battle. Now, we have obviously more competitors, but we have won our first matches. Still, it was really ... it really gives a little extra when you have competition. It gave an extra kick. It really did. Seeing that we won against our competitors was great, it was really. When you looked at fairs and so on, other competing systems, and saw that here we were better and there we were better and felt that every time you looked at the competition, that you were one step ahead and also that the customers saw it and were aware of it. It was great.”

In order to explain what motivated them back then, Bent makes a comparison with the people he hires today. What he looks for is the same qualities he thinks they had at the beginning: “But there is absolutely something ... some motivation and things like that. But there is definitely something in it, that is to be allowed to play with cool equipment, with something you think is funny. It is a very very important part of the job. I must also say that when we have interviews - I have a lot of them- then I observe whether people seem like a little child willing to play. Anyone. If you put anything on the table with some exciting technology of one kind or another, well, then is there a difference between those who sit back and think it does look very exciting and those who immediately get hold of it and say, “ wow, okay and it can do that, and it looks good, and you can do this?”. That is the kind of people we are looking for. Those who get involved, that take hold of things and think it’s damn fun to play with. It is very much the type of people who are here.” However, it was not just the fact that you got to play

¹¹ Danske Bank has been mentioned previously and is the bank who if staff decides to leave are the recipients.

with a cool technology. It was also the fact that you got acknowledgement for what you did. “I’ve made a lot of ... I programmed a lot at the beginning so there are plenty of the components around that I have made. And early on, in the first several years, there was ... as a matter of fact, it was so that there were names on the various components: this one was his, this was his part, and it was his part. We used initials as part of the names of some of those components. And it was the idea, like saying that there is an honour of having done something good, and then, when you refer to this gizmo that does something in the process, well, then it is Michael who made this and it is Bent, who made that. So there is also the honour attached, that you are mentioned in the contexts where it comes up and is praised or criticized, for that matter. So, it is a sense of responsibility for a component in the system, and it was extremely strong in the beginning and has probably become weaker over time because we are so numerous. It has been both good and bad, but it’s definitely a loss in some ways. That you cannot feel it quite as strongly. That personal sense of responsibility for a single component, it provides a strength that it is very clear that there is a very direct responsibility for what you have made. And it offers so much that you get the praise and you get criticism, etc. etc. The downside was then that we were highly dependent on a few people. It is like that in the beginning. When there are 10 of you, then you are typically very dependent on each employee.” Bent goes on to say: “And, of course, the risk is that knowledge can disappear quickly. But you just have to take the chance. There are many risks at the beginning of a company. You just have to deal with it. This is one of them – it’s that every employee is an incredibly important piece in a business with five -10 employees in contrast to 200.” This tagging culture has died, now it is development teams, and building the same sense of responsibility is what Bent finds a lot more difficult in the organisation today. When they started, the impact of someone being sick was that much higher – if a person was absent, it could seriously damage their chances of meeting a deadline/milestone with “The First Customer”. And if that happened, it could influence the cash flow in the company, which would mean that pay checks were not forthcoming. This situation, this direct connection between cause and effect, does not exist today. The reason is that today the company is larger and far better financed than “living from” milestone to milestone. On the other hand, the involvement of each individual employee may have changed too.

Inge addresses the issue of motivation when he talks about the social relations in the group at the beginning: “They are also good at solving problems, technical problems. And it was - and it was also a freedom here that we did not have much thought about it as a social group. Obviously, it was a little social but it was very focused on grades. It meant that we got a very

special group of people at the beginning, or rather still have it." It was not just the fact that the group consisted of bright young people. Inge adds that engineers have another drive. When it comes to motivation: "Mmmm, I also believe that it is the motivation for engineers that we can see that we can get this to work, so we have... we can make something that can really replace another product."

Christian has been quoted earlier. Still, when it comes to describing what motivated them, it is worth repeating: "We were actually four people in the beginning, with very strong personalities. So there were always some heated discussions because we are all passionate about it. But I must admit that sometimes it was a little too much discussion. That is like, yes, you throw yourself in, maybe a little too personally rather than come up with a solution. But yes, it was more ... again enthusiastic people who are really passionate about it."

5.5.8 Then and now

In order to remember the past, there has been quite a bit of comparison throughout the interviews as to what is now – and what was then. Because of this then-and-now comparison, the present seems to offer either a confirmation that what was decided initially still works, or an illustration of what has had to change, as it cannot be done any more. It started out very small, with just the two founders. When they felt assured that the idea could stand the test, they hired two more people, based on the confidence that they would be able to land an order which could fund them. That order was with "The First Customer". Within the first year, the number of staff grew to 12.

Dan describes this growth: "I think we were lucky that all those who were experts in something with "the technology" and the software, whom we heard about or could find, were hired. So I do not think that there is a place in Denmark that has greater skills whatsoever in what we are doing now than here. We have 100 engineers, all top notch. Almost all of them are people with a 12.7¹² average from DTU. We have the highest cut from DTU, we have the highest cut from DIKU¹³, we have the highest cut from all sorts of places. Now, grades are not everything, but it says something about people - perhaps intelligence or perseverance - it does not just happen like that." According to Christian, the ability to find talented people is one of the most important things in the start-up: "They were very lucky and good at finding some really talented people to start with, and we still have

¹² The Danish grade scale goes to 12 – 12.7 can only be achieved when students are granted a bonus for high achievement – somewhat like summa cum laude.

¹³ DIKU – Datalogisk Institut Københavns Universitet (Datalogical Institute University of Copenhagen)

(such people) today. I think we still have the right loop that works really well.” Inge not only seconds it but he goes a bit further when addressing this way of recruiting: “We used to employ on the basis of grades. We were completely grade fixated, and we are still very much so. We do not employ people who do not have really high marks, like a twelve average, really really high marks. And it was, and is, quite good a filter if you get those with the best grades average from DTU, as it was, or university. Then you cant go entirely wrong.” As confirmed by Dans’ statement, they still have the same approach.

Have things changed? Yes, they have, but reluctantly. The agile little group with no bureaucratic rules but able to move fast and do what the customer and the market wanted to have seems to be the ideal way to work. But growth demands change. Still, it is difficult to change what was a winning recipe. Instead of maintaining business as usual, some changes had to be introduced. Bent has some reflections about this. He is concerned about making changes for their own sake. You have to respect the difference between a small and a large company. He addresses it like this: “I think it’s been very exciting to see progress. When you are lucky enough to be in a successful company, to see why it is necessary at some point to introduce some new roles to the organization, or processes for this and that, or things like new IT systems ... when you are in a big company, they (the systems) are there just because it has always been this way or is in a manual or something . When you are growing well, you need to be constantly aware why it is time to take it to the next level, or introduce one thing or another. Then, just consider it seriously. It may well be that it is in a book. But it is now or it will be later. And why it is necessary for us... you get the opportunity to see why things go wrong if you do not do it. Because typically, and with us it is the case, you are waiting a little too long. We let things be a little chaotic before we introduce something that corrects the situation.” When asked if it is because the technology is still more interesting than management, he continues “No, I think it’s healthy as long as it does not go completely wrong, as long as it does not kill anything. Wait and see, in order not to introduce too much structure, processes and systems, first introducing them when it is absolutely necessary. I think that’s a healthy attitude. It must not be too late. But the challenge is to see it when it is needed, to see it at the right time. There is also something about letting people see that if we do not do this, let them taste it, then it can actually go wrong - and let us all have a little taste of how bad things can get so that we can all see (the need). And then we do something. That, I think, is really healthy.”

Growth affects bureaucracy in the organisation. It also changes the flow of information and knowledge about the people in the organisation. When they were a small group, the situation was different. Both Inge and Axel

described the situation as very focused. The group discussed what needed to be done – and then they sat down and did it. Now, there are a lot more people involved – and the knowledge about the capabilities of these people may not be as widespread as could be desired. Bent comments: "Today, you can easily risk that someone has the knowledge that is needed, but has not come forward. Yet, if this is somehow important, then it will normally be possible to ask around. We cannot do it with everything. After all, middle managers who know their employees very well should act or simply send an email and ask if there is anyone who has tried something like this before." But the transparency is smaller and more specialized in the teams working on the projects or delivering to them. But people who were hired for one specialty have also been given the opportunity to change to other areas as the company has grown. Still, the common knowledge of everyone and their potential has somehow been lost. In the process, a knowledge- and know-how sharing facility has been tried: "You can make some systems and things like that, and it certainly helps to some extent. But it's just not so, that you can make systems. You cannot ask people to enter everything - in this document please write everything you know about ... We've had it in the past and, to some extent, we still have such a matrix with your name and then ticking off the technologies and such. It is perhaps also very good. It's never really adequate when it comes down to it. I do not really believe in it. It is more something like a little more conversation and a little more asking specific questions. And then someone says, "Hey, I actually know something about that area." At the beginning people were hired because the company needed a certain knowledge-gap filled. By working together, the employees got a chance of getting to know each other's expertise, which is not so much the case any longer. Bent sums it up by saying: "It's probably one of those things where you just have to say, well, it's really just one of the costs of being large. There may be some knowledge that can be lost. If it is, you have to be good at asking questions." Now that the company has grown, certain groups of specialization have evolved, which helps reduce this problem. Still, with two places for product development: Denmark and Ukraine, the possibility is there.

Whereas the competition has been friendly - who sold more licenses, etc., the friendly banter must not evolve into a fight: "The in-house competition, I'm a little ambivalent about it. In a way, it's good - competition is a real driving force in many ways. On the other hand, it should not be so much that you begin to fight among each other internally. It must, for God's sake, not happen in a company like this. We are far too small, in my opinion, and ... so it must... For me, it is important that the spirit of cooperation is that we work together to make the best products, that we can tease each other as good fun that we have sold a few more of our products than your

products. It is fine, but the basic attitude must still be that we have made a good company and good products. The focus must be on the company and not on my product and my component.” Yet, the personal contact is slowly slipping away, from one room to many rooms, from one floor to several, from one country to several. Bent is aware of the process and the problem: “I think it is partly inevitable when a company is very large. Then there will be some people you do not talk so much with, who become “them”, those that you do not have the same personal relationship with. Something like, when we grew out of this one building or the floor below, that we do not physically see each other all the time and every day for lunch and do not know each other’s names. It has an effect. It is a bit more neutral when you know the name of the person in some of the other departments. I think it’s going to have an effect when we become larger, when we do not always see each other.”

The reason the company growth has not torn everything apart may be the fact that they grew at a pace that the young people could handle. Christian describes it like this: “But it’s really impressive to see. But also in a gradual way - I personally think that if we had the money then or investors rang to start with ... There are many different horror scenarios that could have happened. Of course, a crash came in 2001-2002, so I would think that most investors would have taken their money out without giving us a real chance to develop properly from scratch. That’s the main thing for me. It is not even independence, but it’s just like a survival of the context in which we still find ourselves. There have been several crises since, but also the ambition to keep standing.” Christian is reflecting on the difference between the companies that were funded by venture capital and the more organic approach adopted by “The Company”: “That is what I really think is what we have done very well in comparison (to venture capital start-ups). We have kept a balance there. We are growing constantly. But it has not been an explosion or a massive injection of money that makes most companies. They just do not know what to do with the money. And then, typically, quite different frameworks are put into place when the investors join the company and they change a whole lot of processes. Sometimes it is for the better, to bring in a structure and things, and we might ... it is what we could use right now. Because we are growing faster than our own structure can bear. But anyway, I’m truly absolutely convinced that it is a good balance that we have with our financial independence. That is what has made it possible.” Another thing which Christian is proud of is the spirit of the company “because it has the atmosphere that started with the three or four that we were in the beginning and it’s just grown. And what we are actually able to do, I truly believe, we are able to attract people who fit into the culture. That is like a positive virtuous circle effect and I think that is also very important.”

Inge has some thoughts about the small group then and now and about what they were interested in. What brought them together was the technology. As mentioned previously, he found that they were there for the technology. It was not so much a social thing: "Yes, we talked about it at lunch. It was very ... Of course, we were all technology enthusiasts that way, so we thought ... It was two-three years ago. It was a lady from the administration that said, argh, we talk technology all the time. We actually pay for the lunch break ourselves, and I had never reflected on it that you could not talk technology when you pay for it yourself. Because it is fun, so it was actually a comment that I still remember. It seemed..." When asked if it fitted his picture of the world, he says: "In my world... I had never reflected on the fact that they would not talk technology. Just because you paid for your lunch time yourself." Inge still has not quite grasped that this could be an issue. He understands that the administrative personnel are not engineers, but that does not make the technology less interesting.

Regarding the organization of the work, Inge sees that there have been changes: "Well, we are much more ... the collaborative form is ... Yes, we have a different hierarchy in the way it's still a flat organization but we are very ... now I'm in a specialist role because I have deliberately not gone the management way, but I have ... Anyway, because of my network within the company, I can still jump around a bit, but otherwise we are much more ... I have not visited customers, for example (for a long time). More and more, I only do what I am really good at, so I have become much more specialized." When asked if he missed something, Inge summed it up: "What I miss - nothing really. I miss the fight."

5.5.9 Learning

When looking at a company which has revolutionized industries and grown rapidly, it is obvious that the members of "The Company" team must have learned several things in the process. First of all, the team has learned to run a successful business. When they started growing after the first order, they had to acknowledge the fact that when you deal with multi-billion corporations, it might be a bit intimidating to be fresh out of university. Secondly, they had to learn that it was not an academic discussion with one part being right and the other part being wrong. When negotiating a big contract, concessions had to be made. To do that, they acknowledged very early that they needed someone with a lot more business experience than they had themselves. Not only did they realise it, but they also brought in a CEO. This was a turning point for the company. From then on, the company had a experienced businessperson at the helm. It was so established that it could attract relevant high-profile candidates and pay their salaries. The founding

team, interviewed for the case, made it is clear that working in a start-up, with both “engineers” and business school graduates, was where they have learned to run a business.

Poul reflects on how much he learned in the start-up compared to how much he had learned as a student at DTU. First, he says he knew as much after two years. Then he says one year, and finally smiles, and says it was less than a year. In his opinion, he learned more engineering in less than a year after he founded the company with Dan than for five years at DTU.

Getting the group to reflect on learning was hard during the interviews. They were not opposed to it, but they seemed to live it rather than register it. Dan and Christian had all the theoretical knowledge about “running” a business and were in charge of the financial side as well as making the business plans both for the competition and for negotiating with investors. They fully agree that the practical knowledge of how to do it did not come from business school, but originated from doing it at “The Company”. Dan characterizes the learning process in detail. He describes how different aspects of his master’s degree in finance gave him a foundation for understanding the dynamics of starting the company: “I actually think that a M. econ. program is great because during your undergraduate studies, you have both marketing and finance and accounting and so on, so you get a broad introduction at such a program. Then I happened to study finance, and I thought it was very ... it was great for doing the business plan. It makes you learn a lot about strategy and financial analysis and learn how to make business plans. So indirectly, at least ... the long-term share analysis is also about some of the things that you need when you make a business plan. It’s maybe more about ideas of what some other companies do, but that does not mean that you cannot apply it yourself, when you have to write what you yourself want to do, and in terms which an investor is used to reading.” Summing it up, Dan says: “I can recall myself, as I studied for my bachelor at the CBS. If I had business experience, I would have found that the subjects were 20 times more exciting than I thought at the time. As a matter of fact, I thought that many of the subjects were pretty boring. But when you start up, you can see the relevance. If only I’d known that at the time, indeed I would have studied with much greater interest, and learned a lot more from it, because it was actually relevant. But I was just not ... it’s incredibly important that people can see the relevance of what they do, because otherwise you do not learn in the same way.”

Dan has a very pragmatic approach to learning entrepreneurship: “Have you read some of those old books about how Bill Gates started up, and how Steve Jobs started up? There are incidentally many common denominators. But if you can get them (the students) to read such a book, if then they have a little business gene, it is certainly extremely motivating. There are people

who are able to execute, there are so many who can write and talk about things but do not execute all sub-tasks inherent in starting. I think we are good at that."

When addressing the issue of technology, both the founders agree that it is the cooperation in "The Company" that has formed their knowledge about "the technology" and technology in general.

Bent mentions that he finds it very valuable that he has learned new areas of expertise: "You might also find a new interest. You can say, I've been a highly skilled technician and specialized in it for some years, but my interest has shifted more towards other things, such as the organization and management and staff and such, and it suits me just fine." This was made possible because as the company grew the need for these areas of expertise became clear: "The possibility to try this wide range of tasks and see what you really think is the most exciting. And so you might make an effort where you think it is most valuable. And the transition the transition has actually been really nice to me and so being able to do it at the same time as the company grew, I could increasingly try things and find out what I thought I would like to do." So from being a specialist, Bent moved to management – of specialists.

With regard to learning new skills when needed, a recurring topic is the kind of people they have recruited. Bent explains their way of tackling these situations as an academic problem: "Yes, that is - if we talk technical issues which we had never experienced before, we have probably been good at handling it. It has typically been people with a very strong academic background – Ph.D.s, Masters, etc. So handling a new situation, in this case a technical problem we've never seen before - then what do you do? I think our staff in general have been very good at handling this form of information search in articles, contacting their network, browsing the Internet, making experiments and also having to have different views on what to do. I may be the type who starts taking a look at what already exists, as you say literature review, though not too much, but still just to see what is actually out there. Whereas Poul is perhaps more the type who wants to say ... let's try something that is ... we ... with guarantee, I can make it better than it has been done before. And then we try it. But the combination of such different approaches to this sort of problem has actually been very healthy - and it has done that some things have been solved one way, other things have been resolved that way, we have even taken to solving the problem ourselves. And it is, as with so many other things, it's healthy to have people with slightly different backgrounds who think a little differently. And sometimes one approach is good, and sometimes another."

When asked about the learning process for problems outside the company's area of expertise, and given an example from a project at a university,

Bent says: "I think there is a relatively high degree of self-confidence in 'The Company'. There are obviously areas we do not know anything about. We do not know about sewer systems, but within the area we are dealing with, we have some fairly talented people. We have people who are experts in different things and definitely at the level where you all are able to find in Denmark if not in the world. So it is with reasonably big confidence that if there is a solution to this, then we can find it. But there are obviously places where you encounter ... that is where you are at odds with what can possibly be done, and who must then decide whether you need another company to help? Or you ... or as we have done together with an institute at the university or..."

The solution Bent comes up with is: "Yes, then it is about getting hold of the one who knows most about this area. After all, the network is not greater than that in Denmark. We know roughly who is the expert, who is a super-expert in optics or in any engineering question."

The interview with Inge deals with the same topic as well, intertwined with creativity and innovation. The question discussed is the problem of thinking out of the box. To frame it, the example of Boeing's new dreamliner is brought up, which was claimed to be the largest plane which could ever be build. Could someone come up with a new material and thereby redefine the industry? Inge does not see that as a problem. His background would still be in play: "Yes, but then you are still using your aerodynamics. You still need to transport it on the ground, so you still have plenty of basic knowledge: how to calculate things, how to set up a differential equation, how to make optimization, how to do abstracts, how you make a model structure. There are a lot of tools that are good at making things easier. I do not understand why technically well-founded people or someone who was good at school would be bad at being creative." Then, the interview addresses the difference between vertical and horizontal innovation, or incremental and radical. Inge continues: "I get it - I've heard it a little different that you've a paradigm shift that runs on a trajectory and then refines the technique. And then, when you produce a new type ... but you could say that ... that we started with ... it was very ... No, I don't know - but we were not high-tech from the start. But the products we are coming out with now, we are really innovative. But in the beginning, it was a technology. 'the machine' was not a new technology we invented. It was not us who invented it. We took it and we ran with it and we refined it and we optimized it, so to say. The software was where we were more creative, you can say. Yes, it was where we were much more creative. We did not make a paradigm shift. It was not a completely new type of technology we used." Regarding introduction of new knowledge, Inge recalls: "It was super exciting. I like to learn new things, and to be able to find people who can do something

you can't do yourself. And we sat and read a bit about "the technology" in books, trying to find out who is teaching the subject and try to find them. Yes, we had the opportunity to be creative and find people and sell it to them. I simply had so many interviews - and I even tried to understand a little bit of it myself. If I could ask and get a sense of whether they were overselling themselves, or whether they could really do something. It was, it was three years ago when we took this big step towards doing more technology ourselves." When asked if this need for learning a new scientific area, a new technology, had not been present before, he recalls: "No, it was not. We bought it. Well, yes, a bit - we've seen it once before. It was when we went one step from ... in the beginning there was "the machine", then there was an en additional technology, and then there was yet another-one. In the beginning we bought cameras, and one of the things that we really discussed very much was - was to make our own camera. And purely conceptually for a software engineer to go from buying something and then ... software for it ... to ... No, let's buy only parts of it, and then make our own - and buy our own. We bought parts and so on, but it was a big leap. And we had done it once before, we had taken the leap. And it was Poul who pushed for it - and I was positive too - but Poul was very positive. Now we were going to make something new." They had made this sort of development before: "It was when we started on our old "machine". We replaced a purchased part with our own, and that means buying a small part and then making our own electronic board and then making our own and a control for it . And it was a great leap we made. When we made it, it was probably in 2005 - 2006, it was a big leap. And after that, it was easier to go on." Not only did this push for new technology lead to new knowledge but it also gave a bigger margin: "There were many competitors who had not considered doing it and all of a sudden we created a high added value instead of paying 12,000 DKK for a unit. Then we paid 20 USD for a part and so we made a board for a few hundred. We got a faster and a better unit. We could make it so that it was completely optimized for our "machine" plus the fact that it was a third or less of the price. We made our competitors drop off quite quickly when we took that leap."

How to get the lead or the job of making the push for a new technology? Inge simply said that he took it, suggested that he went to some conferences - went on trips to see what was going on. The story of the first additional technology shows what Bent called self-confidence: "Yes, the additional technology. It has often been the case that when we switched technology, we were often invited to a competitor. If I tell about what we did: we were invited to a competitor who had made something that did not really work. But I was there and I could see that it was pretty cool technology, and as you become inspired by it - they even made their own parts and did not think it

was that difficult - and then you become, well, how difficult can it be? And then you come home and then you get started doing it. We can improve the technology, but we must have the knowledge they have. It can be said that it was the same as with Poul. He visited a parts manufacturer and saw what they were doing. They were, well, they were mortals like us and they did it. So how difficult can it be? It is when you see someone do something that you do not have competence to do, but they are engineers like you, then you think "how hard can it be?" Then it becomes defused - and then it is easier to take the leap." How they manage the process and how they make sure they know enough: "We do trial and error, and we often do it so that you follow a course. And if you cannot show progress after a while, then it will be closed. We have historically ... we have made very few big grand plans, or grand sounds negative. But we might have thought a little, we have just made it, looked at the options and made it. And if it has worked then we've continued. We've run a lot on gut feeling and checked. If we believe this can be a good technology... and if yes, then ..." This approach may seem a bit organized, but it has kept the company out of high-risk projects, where the end result could be more risky. Though, they have had one high-risk development project so to say out of character for the company: "We have seen some competing systems, and we have seen some examples of universities that have made proof of concept for us, where we see that the basic technology can probably get to work. So it was, of course, but it has not been very ... It has been a real risk project where we had been forced to develop a lot before we could be confident that it could be made to work well. So it was the biggest gamble we have made so far, but it seems to go really well." When asked directly what he has learned from being in a start-up, Inge replies: "What is the most important thing? The fact that you can be... this, that one should not have access to much money. When I was with Danfos, we had so much money, always. So we did lots of things that were not really focused. You have to be a little hungry. And secondly, you must have really really sharp engineers who are good at gathering (acting on) information." When asked if he has learned anything in his field of expertise, Inge does not have an immediate answer. When asked about optics, he says: "Yes, I learned very much about that (optics). Yes, it has ... I ... Well, yes, I have - but many of the tools I use today are more or less statistics and mathematics. And it ... where I've not learned so much new, but I have been less afraid to throw myself into something new. I can say, in a way I - I know that I do it very well."

5.5.10 Business plan

This case study started with a presentation of how Venture Cup Oeresund was established. The prominence of the business plan in that competition was emphasized. Since "The Company" won this competition, it is only appropriate to end with their business plan and its importance for the company. Let it be said immediately, had it not been for the business plan competition, it is questionable if "The Company" would exist. As an initiator, Venture Cup Oeresund and its business plan competition were of immeasurable importance. However, was the business plan of the same importance for the company? Did it fulfil its goal as an important part in the creation of the company?

Dan, who had it as one of his main tasks to make the business plan together with Christian, recalls it like this: "No, because Venture Cup was really a sideshow rather quickly. Venture Cup put us together and made us sit down to write it (the business plan). There was phase 1. There were three stages at the time. When we were halfway in Venture Cup, we had already founded the company. We had already hired two people, so it was like... tedious. This was, at least, serious - already then." When discussing the importance of the business plan in the venture, he says: "It (the plan) evolves all the time - but then, no wonder we did not want to write more business plans after that period."

What happened with the plan then? First of all, it was the cause of the start of the company. Secondly, it was a way to finance the company – if they won the grand prize, which they did. Thirdly, it was what was needed in order to get into negotiations with investors/ venture capital. But they also did it to clarify in which direction to go. Christian explains it: "But also to get a clearer picture ourselves about what we wanted, what we could do, about what various markets before us were like. For it is also as I said. The focus we got in the beginning was crucial. We knew from the start ... and it's also what's kind of funny to see because the timing was slightly different. But the markets we have today, we had already planned or conceived at the time."

Neither Bent nor Inge has any recollection of the business plan. They know about Venture Cup but they were not involved. Axel, on the other hand, recalls that when he joined as the fifth member, just when the contract was landed with "The First Customer", "there was a business plan. Business-wise it's run very tight, one can say. From the start, it's something which set us apart from many of the others, typical engineering start-ups where it is technology that is exciting – and then hoping to find someone who can see whether it can be successful. Whereas this was a partnership between an

inventor type from DTU ¹⁴ and one from CBS ¹⁵. From the start we got an award for our business plans, and like all the time we have had focus on the economy in the company. The few people who were involved in it have been tough but fair. I think it's slightly in the DNA of the technologists to make technology and so they want as many users as possible. It's fine if something comes out of it, but you can, well, hardly allow yourself to take money for it. So there has been a good synergy in that at least there was control over the economy." He sees a clear influence of the work on the business plan on the start-up.

Comparing the purpose of the business plan when the company was started with today, Dan says that: "Now, we are following plans. But we will not follow a 100-page plan describing the market and the competition and it... We know that we have a relatively good understanding of the market. We do not write it down in a business plan. The purpose of this (the business plan) is, of course, that you need to communicate with some investors or stakeholders - but it had the purpose that we got the growth bond from Vækstfonden ¹⁶, etc. So it was not because it was meaningless, it was not a total waste of time." The balance between wanting to attract investors and venture capitalists creates a dilemma between the plan and the reality of what is going on: "Well, I think that precisely venture capital may just be dangerous. If you write a business plan that is focused in one direction or the other, which then turns out not to work out - and if you then have some investors who insist that you must continue with that idea. There has to be some flexibility. And we've even been able to determine it ourselves when we wanted to go into the dental field instead of hearing aids or focus on both, etc. and maybe able to opt out of some of the things that stood in the business plan, which were completely unrealistic to do at the same time, so that you do not spread yourself too thin."

Even though Dan and Christian had business plans as one of their most time-consuming tasks for nearly two years, and started negotiating with investors etc. in that function, the plans never came into reality. First of all, they started the company before the Venture Cup plan was finished. Secondly, they never got to finalize any agreement with any investor, simply because when they finally agreed with someone about the value of the company, they found that the cash flow was so strong that they did not need additional capital. As Christian mentions, a lot of the plans came into being, but, as Dan states, they did so in due time, and when they found that it would be beneficial for the company. Bent mentions the dilemma of a lack

¹⁴ Denmark's Technical University

¹⁵ Copenhagen Business School

¹⁶ A foundation set up to aid start-ups and other companies, by guaranteeing their loans

of structure, which a plan could provide. Still, he is in line with Dan that the plan will only make sense to the company when the time is right.

Analysing the case

6.1 Introduction

The themes described in chapter 5.2 will constitute the guidelines for the analysis of the cases. Though the cases were described separately, they will be dealt with as one in the analysis, as they support each other. References will be made to both the theoretical chapter 4 and the cases in chapter 5.

6.2 The role of Venture Cup

Starting with Venture Cup as an organisation it has according to its mission statement today, 3 purposes;

Venture Cup works to inspire and empower university students and researchers to develop their ideas into successful companies.

Our purpose is two-fold; to inspire and motivate entrepreneurship among students, and to turn academic knowledge into viable high-growth businesses.

We focus on entrepreneurship as a practical discipline and we expose our participants to a great network of experienced entrepreneurs and business people, who provide valuable advice on a volunteer basis because they share our interest in finding and supporting Denmark's leading start-ups.

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These have not changed over the years according to the people interviewed. Using these 3 things as key points let us then turn to the case in question.

Did Venture Cup inspire and empower to make ideas into successful companies? Regarding inspiration, there is absolutely no discussion about the organisation's ability to inspire. In the case study, Dan connects the start of the company with seeing a poster inviting students to join the competition. There can be no doubt that the competition served as an initial stimulus for Dan to contact Poul, as he needed an idea to use in the competition. As he said: "I think already relatively few minutes after I saw that there was a competition ... so I thought – firstly, that I wanted to be in it and then I thought what I can use and that was how I thought, by golly, - what Poul told me about at the Christmas party two months ago - it was so obvious." So the connection between Poul and Dan was established because of Venture Cup and Dan's desire to participate. He states that without Venture Cup "then it is not sure that we would be here today. Then we might have started something else, but it was certainly what brought me and Poul to come together and made us start something together."

As the company participated in Venture Cup, it is not surprising that the competition had an influence on the initial phase of the creation of the new company. The company was based on the master's thesis from DTU and set up in cooperation with a person writing his master's thesis at CBS. Venture Cup aspired to enhance entrepreneurship among university students and to transform academic knowledge into viable high-growth businesses. In this instance the participation of the founders of "The Company" in Venture Cup made the organisation fulfil its mission. The question is if this outcome is typical. A look through the homepage of Venture Cup shows that among their alumni there are hardly any high-growth companies.

Regarding the last of the mission statements, it is a promise of support and advice from entrepreneurs and business people. The story from Venture Cup is somewhat uncertain. There is no doubt about the three phases of the competition. For each, lectures were given and a book was made by McKinsey to support the participants. A group of volunteers supported the participants. In the beginning of the competition, until transferred to a student-run organisation, the majority of them were young McKinsey consultants. As to their influence on the case, it is debatable. A McKinsey consultant remembers that he established the contact which led to the initial order for the company, whereas Dan recalls it as a result of a research of possible applications. In any case, it was "the machine" and the team who got the order in house, which was not a result of getting the contact. One thing which is definitely not in the idea of Venture Cup is to start a company without a business plan, which was exactly what the company in the case study did. Before the competition was half-way, they founded the company and hired two employees. In doing so, they made a very significant diversion from the Business Plan School, as described in chapter 4.2.5, and entered an

effectuation mode, as described in chapter 4.2.7.

There can be no doubt that Venture Cup was essential in bringing the two founders together. Also, the three phases: an idea competition, a market analysis for the idea, and finally a full business plan, together with the need to hand in parts of the project, led to the desire to start the company. Still, the decision was made in phase 2, based on the knowledge they had and their ability to acquire capital.

6.3 The importance of a business plan

In order to answer this question, it is important to understand the role it plays and the knowledge necessary to develop it. Because if a business plan is not needed, does that then mean that the market knowledge – the finance – book keeping etc. is as useless? Not likely. If you look at the rationale behind the business plan school of thought, it is in contrast to Effectuation, that you should build the best possible company, not the best company you can build. The difference is that the best possible company may require a lot more capital than what you may be willing to risk. In order to get this capital you have to come up with an iron clad case presenting your business idea, and arguing why you should be allowed to borrow the capital needed or why an investor should invest in your venture. In order to build such a plan, you need a lot of market research and a lot of estimates of cost and profit. In short you need a lot of business understanding, which is not void by leaving out the business plan. So if you start without a finished business plan, then you still need the capabilities – just for other purposes.

When the company was started, it was done so on the basis of an idea that this technology had a future, but also that the money involved were of a size which any graduate student would be able to pay back over a "life time".¹ The banks ran so to say no risk, but the students did, and so did the founding team. The business plan played the role of future financing – both in the short run – could they win, then they could get the prize money, if they didn't they would need the plan to attract venture capital. So as a classical starting point that is when the plan is finished you go to the bank and asks for financing, this was not the case here. A sort of plan was presented to the banks and loans were given, as Dan recalls it without too much trouble, they needed the money for their private companies who would then in return own the start-up. If their own bank wouldn't then others would. The plan was not in focus, the people – that is the two students were.

¹ The assumption is that the amount lent to the students at the time of founding the company is no more than a price of a small car, which is an amount that a graduate should be able to pay back

In running the company it is interesting to see that the founders and the first employees look at the business plan as a requirement for Venture Cup, also necessary in order to attract venture capital, but not as a roadmap for what they needed to do. However, the last of the employees interviewed refer to "the First Customer" as a result of the business plan. Finally, "the First Customer" was in one of markets they intended to research for their business plan.

Two years after the company was founded, the business plan finally resulted in an offer from a venture capitalist. Nevertheless, at that point of time the cash was no longer needed because of the initial order, and the fact that they retained the rights to the product. The company could survive and continue as a self-financed venture.

6.4 Financial risk

As discussed in the previous chapter, the financial risk taken by the two founders involved the loans taken in a bank, as recollected by Dan app. 100,000 DKK, which in today's value amounts to app. 130,000 DKK. Of course, the risk is relative to what other debt the students may have had. However, given that it was a loan, it may be safe to presume that the founders did not have much other debt. Although it would be sad to lose the money, at a time of an economic high and close to full employment, it would not condemn the founders to a life in debt. To the founders, it was a risk worth taking. Today, the founders address the question of risk-taking in a matter-of-fact fashion. They recall that it was relatively easy to get the loan. One of them had to change banks, but other banks were more than willing to take the chance. In a Business Plan School sense, the amount was not big enough to fund the company, but only sufficient to get the company started. Seen from a perspective of effectuation, at the start the founders complied totally with the idea of risking only what they could afford – the app. 100,000 DKK.

If risk is viewed not just in monetary terms, the founders could have ended up founding an unsuccessful company – and after a while they might have had to close it down. Career-wise, it could have become a small blemish on their CV, and it would have raised serious questions about their sincerity when applying for a job, in the future even hindering them from acquiring new capital for a new start-up. For the hired members of the founding team, the situation was somewhat different. The three graduates interviewed saw the start-up as an adventure. Given that jobs were easy to get and the pay was relatively good, it was not considered a huge risk. The financial risk was then just the time necessary to find a new job. Also, as they all state, finding a

new job was neither a problem nor a worry. In this case, the founders have a very unique situation since the growth loan guarantee and the order from the first customer left them with enough cash flow to not only run the company but also to let it grow. As stated in chapter 6.3 about the business plan, the need for venture capital was nonexistent when a deal could finally be struck, so the owners ended up as majority owners instead of part shareholders.

6.5 Founding team

Chapter 4.0 about theories of innovation and entrepreneurship discarded the notion of the entrepreneurial hero – a person who could build everything single-handedly. Next, the trend moving towards a theory of entrepreneurship as a process was evaluated first in chapter 4.2.6 and later in chapter 4.2.7 about effectuation. The notion that founding a company is a one-person endeavour has been seriously questioned, and other solutions have been put forward.

The very first question for the founders of “The Company” was “Why did you found this company?”. The question had been used by William B. Gartner² at a Ph.D. course about “Entrepreneurship as Making.”³ The essence of the question is not “how” did you start your company? but “why” – and interestingly enough, within the first sentence both of the founders stated that they had not founded it themselves, but together with other parties. They both agree that this premise has been essential for their decision to start. As Dan states it: “When you want to make a technical product, it is obviously not enough just to be myself, but I think you will see many examples of companies that are started by more than one founder. It is probably healthy that there are people with different backgrounds - and with different view of things. One with a technical and one with a commercial background is probably a good combination. But I must say that Poul is also quite commercial. He had had some small business before we started as a hobby during his studies, as had I.” When they had decided to found the company, the team was expanded with two members: a technology expert to help Poul develop the technology and an economist to help write the business plan. At this point of time, the project was still twofold: to develop the technology and to attract venture capital in order to secure that the company could survive. The two employees who were brought in were paid a salary. With the two people on the payroll and remuneration of the owners, the funds would eventually run out. However, the risk was not such a big issue for any of the participants in the founding group. Among the interviewees, one would not

² Professor at Clemson University, now CBS

³ Held by University of Southern Denmark/IDEA Entrepreneurship Centre

be affected in any significant degree: Axel was out looking for a student job to finance his studies. Should the company go under, all he would have to do was to get a new part-time job. For the others: Daniel, who has not been interviewed, Bent, Inge and Christian – the risk was there, though it was not viewed as serious due to the favourable employment situation.

It is interesting to note that the only one who had had a connection to the founders is Christian, who had studied one semester with Dan, so he knew him, although not as a close friend. Daniel applied for a job and got the position. Later, he took part in head-hunting Bent and hiring Axel and Inge. According to Sarasvathy, when adopting an effectuation approach, entrepreneurs raise the following questions while starting a company: “Who are you?”, “Whom do you know?”, “What can you do?”, “How much can you afford to lose?” The “Whom do you know?” question was relevant for the two founders – and for the relation between Bent and Daniel, Dan and Christian. They were not a group of young people who knew each other well; they were a group of young people coming together in order to solve a task. For Dan, the goal was to participate in Venture Cup – and as a result to found the company together with Poul. For Christian, it was to help someone he knew to make a business plan – and take care of the financial side of the company. They were all there to solve a task, not to befriend each other. As Axel said: “It was ... it was the pace I would say – it’s something you have to think is fun. It is the continuous long hours, uh, that you are passionate about getting through and we were all very young and inexperienced, work-wise so there was no ... there were thoughts about leadership and organization, responsibilities ...” which describes a team where everyone had to pitch in and an organisation where they were learning to be more professional as time went by. Inge puts it: “Yes, that is - we had a shared understanding of what the customer needed, and so they gave us development tasks which we then had to do. It was pretty ... there was never any major discussion about what we should develop. We divided up the tasks rather, we talked about what we had to do and so we sat down and we made it. More or less, there was not ... It was great, we were playing the ball. Just this big customer whom we had in the beginning. What does the customer need right here and now, what is the most important thing next week or in the next 14 days? So the development was not ... We had, of course ... I feel we did not have huge strategic considerations. We were very focused on the task for the customer, to proceed and get to next step (milestone).”

6.6 The Customer

In a classic economist approach, customers are viewed as the market. This was done by Adam Smith (Smith 1966), Schumpeter (Schumpeter 2008), Kirzner (Kirzner 1978). Kirzner even created a view of the entrepreneur as a person who took advantage of a market which did not function properly, exemplified in his use of market unequilibrium. The business plan deals with customers as an anonymous base making up the market. As it was shown earlier, there are many suppliers of road maps to creating a business plan that require a description of the market and the potential customers. What seems to be more interesting is to get a road map of how the entrepreneurs plan to engage with the customer, in order to create a winning product. In marketing, customer needs are analysed, but only when using open innovation and co-creation (Von Hippel 2009) is an interaction between company and customer aimed at making a better innovation – and subsequently, a better pay-off. In effectuation, on the other hand, we start out with the means available, and how we can use them to create a business. This is described in Figure 6.1, Causal versus Effectuation Approach,

where a business plan starts from the analysis of the market, then it defines the market and eventually engages with the customer. On the other hand, effectuation starts with the entrepreneur through the questions, Who am I? What do I know? Whom do I know? The questions above are instrumental in narrowing down the category of products or services that can be offered to the customer. The customer plays a substantially bigger role and is involved a lot earlier than in the classic business plan approach. This leads us to the question of how the difference played out in the case of "The Company", which was engaged in a business plan competition but ended up contacting a customer before they even had a finished plan.

First of all, the customer they found and engaged with was one among others in their pool of ideas for where to implement "the machine". However, they did not contact the customer with the desire to learn more about

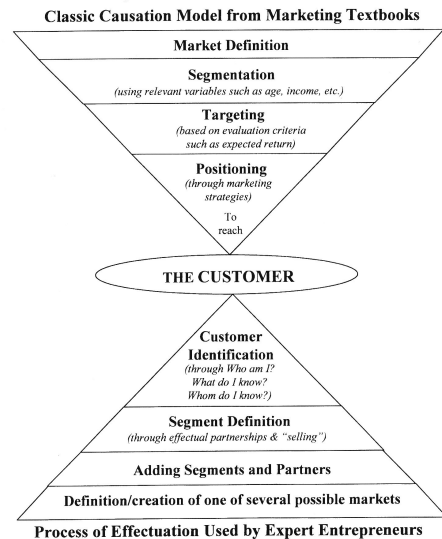


Figure 6.1: Causal versus Effectuation approach

how they could develop a product for this industry. The reason they contacted the customer was to get an order. As Dan said: “We pitched the idea of doing quality control”. However, the customer saw more than that. They saw the opportunity to make use of other projects, or as said by Christian, they had a patent which they could put into use. The conflict between the business plan perception of a customer to enhance the product and make it better before launch compared with the need to get a paying customer to generate cash flow is a prime example of the difference between a causal and an effectuating approach.

The customer did not only create the cash flow needed. The customer also gave the development its focus. Everyone involved in the start-up stresses the focus it gave to the company. Dan described the risk of getting too involved in development just for the sake of developing as: “do a lot of developments before they actually come out and uncover what in fact it is that the customer wants - I think that’s our strength - that we understand.” Bent makes the same observation: “If there is a customer who really believes that they can use it... Most of us technologists, we are great at technology, but we do not know a lot about the industries (which they develop for).” The customer not only changed the direction of the development from quality control to a production system - starting with a cast, which was made into the shell for the final product during the process – and managing this process. They only paid when the stages met their deadlines. It also gave urgency to the project. It was not a question of whether or not a hypothetical customer would appreciate one or the other solution. The market was replaced by one customer, acting on behalf of their future market. So the question was continuously “Have we met the criteria agreed upon at the last meeting?” As Axel recalls: “There was a commitment, and pay-at-milestones along the way, so we got it. They gave us some money up front, and then we started to make it. They always knew how it went, and at each milestone they could say - we do not go on to the next milestone.” This focused the whole process. The team did not have to make all the decisions about what to do and when to do it. Neither would it end in discussions about the best or technologically most interesting solution. It was about what the customer wanted, and what the customer would accept as the following stage gate. Inge has a comment which expresses it: “What does the customer need right here and now, what is the most important thing the next week or in the next 14 days”?

What did the team get from the customer?

First of all, they got the cash flow they needed. Secondly, they got to make a functional finished product. Third, they got to work directly with a professional organization that knew what they wanted and could be very precise in their requirement specifications. Forth, they got to keep the IPR,

which meant that they could eventually take the technology to other manufacturers in the same industry. Fifth, they learned how to operate as a real business.

6.7 Technology and the machine

The technology and the construction of the machine have been an integrated part of the story. As shown previously, there are theoretical processes for innovation and there are theories for how to start a company. Both areas have moved from a very stringent sequential way of perceiving it to a far more elastic and iterative model. Innovation models describe it as a process of constant interaction between science, technical research, product development and market transition, as seen in Figure 6.3, with the entrepreneur as the element connecting everyone and, in line with the Schumpeterian thought of Creative Destruction, being able to plot to destroy the existing business by combining “things” in an attempt to create a new order of things. Does this new product, then, only act as a vehicle for change or does it have a role in itself? In the sense of Actor Network Theory, the technology was there. As Inge said: “the machine” was not a new technology we invented. It was not us who invented it. We took it and we ran with it [...] We did not make a paradigm shift.” So the technology did not act – it was more of an actant waiting for someone “to run with”. Could it be anything, though? Did they just want something to work on?

For Poul, the technology was so interesting that he wanted to write his master’s thesis about it. For Dan, it was a ticket to enter Venture Cup. He remembered Poul talking about it at a party, so it must have been relatively interesting. Dan saw the poster advertising Venture Cup, and as he recalls, it did not take long for him to decide that Poul’s project could be the subject. Thinking back, he mentions his interest in computers and technology combined with his desire as a kid to be a 3D animator. It could be a rationalization, but it sounds plausible – given that he remembered a conversation about technology which took place at a party. He was hooked when he got into the technology and when he realized that what Poul was working on was actually as unique and as exciting as he had been told. And for the two founders the rest is so to say history.

For Christian, who had chosen a non-engineering education in a family of engineers, his first choice -banking - seemed in line with his studies. He describes the technology saying: “Yes, it was new. It was exciting, it was futuristic. So it was important, yes, totally, yes, it was super important then.” If you are looking to become a merchant banker with a specialization in pricing dot.com start-ups, and you have one foot on the plane to London,

and then change your mind, choosing to write business plans in Copenhagen, making sure there was lunch for everyone, picking up parts and bringing things to the painter, then the technology has to be exciting – and perceived as a good opportunity.

What about the engineers – how did they perceive it? Axel, the computer scientist who was brought in when the "The First Customer" order was landed, said: "They showed me some things - and it looked as exciting. It was exciting technology and I wanted to get involved." Axels' field of expertise is programming. For that reason, he does not express the same closeness to "the machine" – but has a fascination with the technology. Bent addresses it in a more general way: "But what primarily drives people, I think, is still the technology, because it is an exciting technology, and it is what really makes people tick." (...) "It is the technology, it's people who are trained in this area and they want an opportunity to use it, and perhaps that is what makes us so special, I think." (...) "... but I like to make things. There must be some product, something to come out of it. I think - it's a cool product, it's something that really is, it's been fun to make - it's fantastic that it can be done." The pride lies in the product, and it seems that the existence of a physical product is important. Inge, who defined his job as helping to get "the machine" to work, says about finding a place to work: "as long as the technology is cool ... I had a discussion at the beginning ... there was... what is called... it was sold to Microsoft. Damgaard, ⁴ he sold his entire administration software to Microsoft for lots of money, so it was like everyone's dream. And I said I did not want it because it is such a boring product, a management system. To me the technology to create a management system is just - it's not particularly creative." (...) "but I will do something with machines - I want to make something like a golf radar or a self-propelled vacuum cleaner ⁵" (...) "yes, a physical gizmo. I think that's something - I can say I have made that." The gizmo, or a cool product, seems to be the focal point of the work, and had a role for the group when they developed it. Christian mentioned it as something he chauffeured around – picked up at the painter's etc. One might say that it was the manifestation of what they were doing, and as such, part of the team.

So how did they build it? Two things are consistent in the story. First, they worked as much as they could within their area of expertise. Second, when the project was in a crunch, they did everything that could help. It was a collaborative effort within the group, reminiscing which brings back a lot of mutual respect. The banter between professions is not essential to the

⁴ Damgaard Data -. Founded by two brothers, merged with another competitor and sold in 2002 to Microsoft for 11,000,000,00 DKK

⁵ The examples had come up earlier as technologies which could have interest to Inge purely as examples of using his background in other areas

story. It is generally accepted that everyone's effort was needed in order to lift this project. The clarity of the project ahead defined by the contract with "The First Customer" meant that discussions focused on solving a specific customer's needs and requirements. Dan describes it: "I think that we had the advantage that the goals were reasonably clear, [where we were going with the product ...] there were those deadlines, and we knew that we had to make "the machine", and we had to make a software. And then, after the first milestone - then came the next phase." (...) "Of course, there were conflicts, there always are. It was not that someone who was ... it was not showstopper conflicts or that someone left us in anger or so. I think that discussions and disagreements about how to do things, it just means that there were several approaches to problem solutions on the table." Inge describes the process in relation to the customer in the following way: "We shared our understanding of what the customer needed, and they gave us development tasks which we then had to do. It was pretty... there was never any major discussion about what we had to develop. We divided up the tasks instead. We talked about what we had to do, and so we sat down and we made it."(...) "I feel we did not have huge strategic considerations. We were very focused on the task for the customer, to proceed and get to next step (milestone)." Inge has the same perception. The focus was to solve the problem handed to them by the customer, and as the customer had specified the requirements, that was what had to be made. He does not recall any strategic decisions to be made, which in this context are decisions influencing the future of the technological solution. He describes disagreements and solving them as: "If there was a better solution, and it was not your own, then that meant accepting it." Axel talks about the speed of development and work, which he recalls as a situation where they prioritized what was the most important thing to do, and then they did it: "There was not anyone who asked how long it takes or when you're done. We just do it. And then you sit there for 10 hours a day and work hard and everyone talked to each other, and then we go and show it to the customer twice a week - now we have come so far - now we have come so far." The time constrictions were the deadlines, agreed upon with the customers. They put pressure on the team. All of them being very young, it was easier to have flexible work hours, and only one of them had a family. They were there because the technology was exciting, and they were making it work.

6.8 Motivation and learning

What motivated the two founders and the founding group? Was it a quest for riches? Was it to prove it could be done? Or was it simply because they

could not help themselves – it had to be tried?

In the interview protocol, the first question was: Why did you join this start-up? Defining what motivated them would be easy if someone had answered “A lot of money” as it was in the dot.com era, when people were becoming multimillionaires in such a short time. But the closest we get to money is when they acknowledge that the dot.com era was there, and that it was very “in” for young people to try to start their own companies. In retrospect, it would be easy for the founders, after having built a large and successful company, to say that this was their goal all along. That they were in the competition for the money, and that they started the company for that very reason. Both the founders stress that they did not start the company by themselves. Both of them find it important that they had a partner. At the start, what motivated Poul was the chance to work on his “machine” and continue the work he was doing for his master’s thesis, whereas for Dan, it was first to participate in Venture Cup. In the process, he became so convinced by the test set-up Poul which had made that he invested his money and time in it.

The founding group had much the same motives. Christian was headed in another direction, but found that this could be very exciting, and as he said it very precisely: “If you cannot do it when you’re 25-26, when are you going to try it at all?” Axel wanted to work with the technology and was looking to make some money while still studying. Bent found it interesting to try to work in a start-up very early on – and liked the fact that they had an interesting technology. Inge found the technology cool and also liked the fact that they were small. It meant more than working for one of the largest companies in Denmark. There was no safety net. They all express the feeling of being young on an adventure. Besides, they all had the perception that getting another job would be no problem.

They all characterized working in the venture as a co-operation with the best personnel. Christian talks about a group of highly qualified persons – very talented, very passionate. Inge talks about a high grade average, as does Dan. It is part of their self-image: you do not work here unless you belong among the best. This remains very much in line with what Napier (Napier, Nilsson 2008) said about creating a good team.

The technology is interesting, and the venues where you can work with it are few. The start-up seems to be the only one with a job security and a possibility to do it for a good pay and with decent work hours. In the beginning, the working hours could be demanding, but it was seen as part of the attraction. They worked hard to meet the deadlines; if they were successful they could continue. Asked if they would have worked with anything, the answer ends up being “no”. It has to be an exciting, “sexy technology”. They acknowledge that other products could offer equal technological chal-

lenges, but they all get back to the attraction of their technology. They all see that it is respectable to produce what they do, but it is not what drives them on. They have few reservations as to what to work with, but it has to be fun, and it has to be exciting. What did they learn? They have all had ample opportunity to try all sorts of jobs. If they wanted to be more a manager than a researcher/developer, then the growth rate of the company has given ample room for trying. They all agree that they have learned a lot about running a business, and about management. But within their specialty, they all find that they have used what they already knew. Upon changing at least two industries, this perception seems a bit odd. In retrospect, learning should have been addressed as patents or potential articles rather than learning. Inge acknowledges that he has learned a lot about a totally new field of research far away from statistics, Christian about technology, Bent and Axel about management. When asked directly, Dan says “I can recall myself, as I studied for my bachelor at the CBS. If I had had business experience, I would have found that the subjects were 20 times more exciting than I thought at the time. As a matter of fact, I thought that many of the subjects were pretty boring. But when you start up, you can see the relevance. If only I’d known that at the time, indeed I would have studied with much greater interest, and learned a lot more from it, because it was actually relevant. But I was just not ... it’s incredibly important that people can see the relevance of what they do, because otherwise you do not learn in the same way.” Is this to say that you do not need a formal education? Absolutely not, but it stresses the importance of making sure that you understand the context in which to apply what you are learning. Poul was asked the same question, and got to the conclusion that within the first half a year, he learned more engineering in “The Company” than at DTU. Could they have learned without their studies at DTU and CBS? No, but working on a real problem, for real, and working on something that really mattered to them has definitely helped the learning curve dramatically.

6.9 Effectuation

At the outset the purpose of this work would be to conceptualize effectuation, not based on expert entrepreneurs but for novices – that is students. In Sarasvathys (Sarasvathy 2008) work presented in chapter 4.2.7, Sarasvathy presented her hypothesis about the approaches for the experienced and the novice entrepreneur. Her hypothesis was that the novice would start in a causal approach – and only if there was a lack of funds would they divert to an effectual logic. The experienced entrepreneur would tend to choose an effectual approach. Over time the novice entrepreneur will turn towards an

effectual approach. The case in this study has all the makings of a novice entrepreneur, and because of their actions, starting the company on their own means, it is possible to see if they chose the causal or the effectual approach. Instead of a causal approach Sarasvathy argued that decisions were made based on the following questions “Who are you?” “What do you know?” “Who do you know?” “How much can you afford to lose?” instead of using the casual approach of a business plan, so how did it act out.

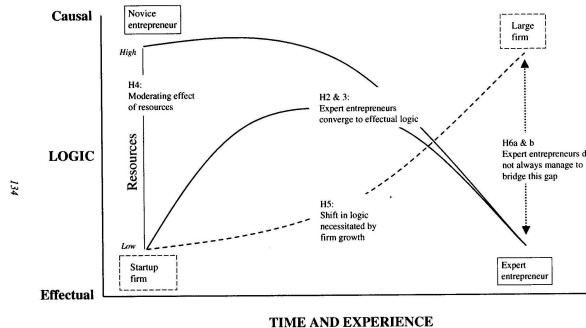


Figure 6.2: Performance implications of causal and effectual logics over the career of the Entrepreneur and the life cycle of the firm (Sarasvathy 2008)

First of all, the contradiction between a causal business plan and an effectuating approach may seem odd, given that the company was started during a business plan competition. Venture Cup intends to help students create a business plan, help them get in contact with investors and inspire them to become entrepreneurs. The business plan competition had three phases: an idea competition, a market analysis for the idea – and finally, a full business plan. Had they followed the Venture Cup guidelines, had they waited and founded the company when the competition was over, then they would have acted as predicted by Sarasvathy. They would have started only when they had a business plan. With that plan, they could get in contact with investors and have financed the company. As illustrated in Figure 6.4, they would have been funded, and would have chosen a causal approach. But they started barely after the 1st phase, where Dan had done his best to question Poul’s ”machine”. He researched the competitors to match their product with the start-up’s own product. Based on this research, they founded the company. Before having received an order, the founders hired two people. Even though their initial investment of 200,000 DKK may sound as quite a bit of money, developing a product and serving a payroll definitely put them on a tight budget or, as Sarasvathy terms it, with few resources. In the midst of a causal business plan competition, they had to go for effectuation.

If you look at what brought them there, the questions: Who am I? What do I know? Whom do I know? How much can I afford to lose? fall very much in line with the process described by Dan. When he saw the poster advertising the business plan competition, he immediately wanted to join. A business plan cannot scare a business major, but the lack of a product or service may. As he recalled it, it did not take much time after he saw the poster before he thought of Poul, their conversation, and Poul's idea for "the machine". This is a fine example of a "Whom do I know"-reaction. It remains consistent with Sarasvathy's description of the process: you do not do it alone, you so to say invite partners in. Whether Poul had been planning on striking out on his own with this product is not clear from his recollection, but had Dan not contacted him, it is questionable if he would have contacted Dan. If this connection had not been made, they would not have established a partnership between an engineer and a business major, a partnership which they both appreciate, and which they and the founding group praise as being a key part of their success. Did they look at how much they could afford to lose? Definitely, they started out very business-school like, with each founding a company, which in turn owed the shares in "The company". What about the business plan? It is kind of ironic that they went from a causal approach to effectuation, and so instead of researching the market, they did everything to get hold of a customer. They let the customer influence them, and change the idea from quality control to manufacturing. However, by making this strategic partnership, they funded the development and laid the ground for future success. Still, they did not quit the competition. On the contrary, they continued and won. When they had the company running and profitable, they kept making business plans in order to attract investors. It was not a business plan for the purpose of structuring their business, which they did by running it every day, but to prove to a potential investor that they had what it would take to grow, and hence attract investments. When they finally succeeded, that is at the point when the company could start normally, they examined the cash flow and found that they did not need the capital, and did not want to give up their independence. When asked if he would not like to own a smaller portion of a venture that was substantially bigger, Dan questioned if indeed they would have been bigger, since they have never been in need of capital.

The questions "Who am I?" and "What can I do?" were essential in the decision of bringing in a CEO. This is also predicted by Sarasvathy as a consequence of being a good effectuator. Poul found that they were too young to negotiate with the large corporations, and lacked the experience in not taking the negotiations personally. As Poul recalled it, he wanted to win. Winning in a negotiation with a customer is not the most desirable outcome. But owning a company and handing it over to someone else, letting them

make the decisions and take lead on the big customers shows a maturity or an acknowledgement of what “I” – as an individual - can do and where “I” have my competencies. As Dan puts it: “Well, it’s about knowing one’s own weaknesses - and one of our weaknesses has been our lack of experience within a business context - so we’ve never had the idea that we had to be the smartest at something.”

At the beginning they exhibit a duality of causal approach versus effectuation, but only in so far that they want to win the prize in Venture Cup, and for a long time they believe they need capital. What they do later is effectuation; they even describe it themselves that they are better at getting things done.

Have they changed perspective on the business plan? Dan said: “No, we are following plans - but we will not follow a 100-page plan describing the market. And the competition and it ... we know that we have a relatively good understanding of the market, without us having to write it down a business plan. The purpose of this is, of course, that you need to communicate with some investors or stakeholders. But it had the purpose that we got the growth bond from Vækstfonden , etc. - so it was not because it was meaningless. It was not a total waste of time.” In hindsight, the plans were made as a means to attract capital or to persuade Vækstfonden to let them borrow some money. They do not do it anymore; they know their market and base their decisions on other things than “a 100-page plan”. They have now fulfilled the path from an underfinanced or lacking resources novice entrepreneur to an experienced successful entrepreneur, free from the business plan. The question is if they ever needed one, that is except for taking part in Venture Cup.

Sommerhøjskole & Summer course

7.1 The Introduction

At the end of doing this study, a chance occurred to make a test of the results as presented in chapter 7.0 Sommerhøjskole & summer course, that is how students respond to a real problem, for a real customer, under time restrictions and with a limited funding, as well as how the machine – object plays into the work. Since it was a course, it was not possible to incorporate the importance of the attraction of the technology.

The possibility presented itself much in the way described in the theory of effectuation. It started out with a desire to make a Sommerhøjskole ¹ within the Department of Continuous Education. Most Danish universities have summer programs. Therefore, it seemed more appropriate to have a Summer Højskole whose purpose is to learn for the purpose of learning and not for collecting grades or ECTS ² points. The department wanted to make courses in the summer time for their alumni, thereby keeping in touch with them. As described in chapter 4.2.7 about effectuation, as soon as you start a project/venture and open it up to others to form alliances, the project/venture starts taking and changing form. During that project, the first issue addressed was the subject for “Sommerhøjskolen”. As a new set of courses in innovation was underway, it seemed appropriate that this would be the scope of the Sommerhøjskole. We wanted to come up with a popular subject and promote our new line of courses at the same time. The team now consisted of two people: a person responsible for the innovation course and a person responsible for Sommerhøjskole. The next twist came as a consequence of a one-to-one rule. The Danish Ministry of Science, In-

¹ Højskole comes from the Danish Folkehøjskole, based on the idea that you should learn for the purpose of learning – a so to say education program for the whole population.

² European credit transfer system – a way to collect credits for a diploma.

novation and Higher Education had introduced a rule that for every Danish student studying abroad, the education of one foreign student would be paid for by the Ministry. Up til then, summer school programs had always been in high demand by foreign students, for the obvious reason of ECTS points and a trip to Copenhagen during the summer and the fact that there were no tuition costs. The new one-to-one rule led to a decision by the management that summer courses would not take place anymore. As a consequence, our own students lacked a possibility to “catch up” or save time, whichever was their reason. A couple of colleagues came up with the idea of making a summer course about innovation, also focused on prototype development and testing. This led to the next turn of the first project: why not put the two together – that is bring the companies together with the engineering students, and have them work together. Instead of having a classic summer university program, we now had a program focused on working with innovation and prototype building and testing.

As stated earlier, the project became a perfect testing ground to see if some of the findings of this study could be implemented into an educational setting. The course, which took place in August 2013, involved a group of students and three companies: Dako A/S represented by Nanna Dehlsen, Avalonia.net represented by Erik Cayré and Accipio represented by Anders Dam Kofoed. Each of the companies came up with a challenge/problem for which they wanted to either find a solution or at least find a better solution. Dako A/S manufactures cancer diagnostic equipment and has recently launched a new machine. At the time of the Sommerhøjskole, they were still working on the usability of this product. Among other things, it consists of a rack for holding object-glasses. These have to sit tight and securely during testing. If they break, this might destroy any hope of detecting cancer, since the test material can be very limited. So the question was how you can make this work process and this equipment as easy to handle as possible – at the same time as you keep the security for the test system extremely high. Avalonia.net is a web-hosting company targeting and servicing Apple users. They have always had the problem of spam mail. Users of mail systems have an interest in receiving 100% of the letters sent to them from legitimate sources – that is mail intended for them and wanted by them. It is a classical type 1 and type 2 error situation: you have to keep what the customer wants - and eliminate what the customer does not want. On the other hand, you cannot keep anything the customer would rather do without, or eliminate anything the customer wanted to receive.

Accipio had made a new type of database report generator, which worked – so the prototype was there. What the company needed was an analysis of who would be the most likely user of its features and whether it was understandable and usable for the most likely user. Whereas Dako had a physical

product, the two others tasks involved software solutions. Even though this could not be planned, it meant that a combination of a software problem and some actual hardware issues created the opportunity to observe how the physical presence of a product influenced the group, both the participants who worked with the project, but also the other groups.

7.2 Real problem – or the challenge

When students decided to participate in Venture Cup, it was a challenge in itself. The aim could be to win the prize money. But when the founders of the company analysed in the case study decided to start a company, this pre-firm phase, described by Sarasvathy (Sarasvathy 2004a, Sarasvathy 1997), was cut short as soon as the decision was made to found the company, not just in a hypothetical sense, but also legally and financially. In doing so, the challenge changed in meaning and importance. You could see it as a sophomoric undertaking as long as all the founders did was spending time on participating and handing in the papers for Venture Cup in each phase. All they could lose was time, prestige and perhaps self-confidence. What they could win was the prize money, a network of business people etc. But the situation changed as soon as the company with liabilities was established. We could loosely characterize it as a change from an academic challenge, very much like an academic assignment, to a problem in the real world, where the budgets were real, and the costs of financing them involved real money, backed with real loans. Their decision was based on their research showing a business opportunity. So in order to discuss the kind of problem they had after founding a company, it is appropriate to look further at the definition of a problem.

In his conference paper, Henriksen describes it as follows “The question is now; what is a problem? Or what would be a problem in PBL learning context? And how would that problem secure both bildung and employability simultaneously? According to Nørreklit (1991), Nørreklit (1978, 1987) (see also Henriksen et.al. 2004) several problems exist in this context. Nørreklit deals with theoretical problems, practical problems and real problems.”(Henriksen 2011) A theoretical problem suits university instruction well. Here, the researcher (and the students) will start his or her project by outlining the theoretical state of the art within his or her field. This theory is then confronted with some facts from real life. This is often called empirical findings or data. Theory and findings are compared and in most cases some discrepancies are found. For most researchers this poses a theoretical problem and the way out is theoretical refinement or in some rare cases theory development. “(Henriksen 2011)

A practical problem is “given in advance. They are just there and ready to be solved. The problem solving process is just a matter of finding the right tools for solving them. This could be a new IT tool, a theory, a new organisation development programme just waiting to be used. A practical problem is linked to everyday operations.”(Henriksen 2011)

Real problems are ones “that call for proper analyses as we do not know what to do about them. There is no tool or theory that is able to frame the problem and we do not know what to do as we do not possess the language necessary to even talk about them. Before we can do that, we need to make a proper problem analysis and a workable problem statement. In this way problems are part of a process, where the problem is constantly re-formulated or conceptualised.”(Henriksen 2011)

Looking at it this way – and with this definition of the term, it is easy to see that what the students did in founding a company, based on an experimental test set-up, was not solving a theoretical problem, where we start out with a theory, then add data or empirical findings. Unfortunately there is no blueprint for what was labelled Research to Invoice. (see chapter 5.4) Nor were they solving a practical problem, where finding the correct “tool” for solving the problem is the most important issue – and as soon as it is found, the problem is solved. For the founding group in the case study, the problem was to apply an unfinished technology to a problem in a company, so they needed to understand the problem in the company, and then find a way to solve the problem. This was done under time pressure, which means that if you missed a deadline, you missed a payment. It is hard to get that in a teaching environment. The only existing similarity is the exam – and you also had to meet with the company and with the other companies and groups and do a presentation. Needless to say that no one wanted to be the ones who came back empty-handed.

In conclusion, what we handed the students was, as described by Henriksen (Henriksen 2011), a real problem, with all the deadlines, all the pressure and all the intensity needed to attempt to recreate the situation of solving a real problem in a start-up. What we lacked, was the financial incitement or consequences. The students did not have to face any consequences, while an exam is a poor replacement for the consequences of going bankrupt.

7.3 Working for a real customer

In the case of “The Company”, the value of the customer was not only the revenue from having one. It was also the focus the customer brought to the development of “the machine”. The arrangement with the customer was to deliver the advances agreed upon at certain dates. This focus combined with

the deadlines made the progress faster.

The summer course deliberately pursued the strategy of getting the students and the companies to interact as much as possible in order to create a rapport between them. For three days going from 8.00 a.m. till 6 p.m., a course was set up in which both the students and the companies took part. The purpose was to make sure that there was a common understanding between the students and the companies about the challenge. This was facilitated by a process, which focused on learning about innovation and, at the same time, ensured that the students and companies developed a unique connection. What the students faced was not just an assignment: it was a real problem that the companies were working on. If solved, it would bring real value. Besides, the students were not solving the problem for an anonymous customer. On the contrary, they solved it for a company they had visited, for a person they they were familiar with, who accompanied them for 10 hours a day for three days.

When observing the interaction, one saw a transition from a business representative explaining what they wanted the students to work on, which resembles the situations normally seen when doing projects, to an interaction of equals. The communication became an exchange of ideas and suggestions, and a common pursuit of clarifying the task.

The programme could not be based upon a technology which the students had previously developed, or based upon any shared interest. We could merely test if there was an impact upon the students of not only being handed an assignment, but also working with the companies in order to understand why it was important.

Avalonia.net, represented by Eric, worked with spam filters, which were introduced to the students as what the company – and their representative - had always worked with and always would. The challenge was to see, if they could solve the problem better and easier than it is done today. The problem is a typical null-hypothesis with a type I error or a type II error. You keep something you should have thrown out, or you throw something out which you should have kept. Making sure that especially the latter does not happen is problematic, since the user will never see the mail, whereas the former is a constant nuisance since you have to throw out a lot of mail manually. If for business reasons, your customers cannot accept that any legitimate mail is thrown out, you also have to accept that the quantity of unwanted mail will increase unless you can come up with a new and better solution, or an easier way of handling questionable mail. In order to come up with an acceptable solution, the students used everyone they could get in contact with as potential sources of information, and in the final stage made up a persona to represent the user, in order to help them understand the usability problem.

Accipio, represented by Anders, presented a software which started out being called a WiKi-base. Understanding what the software could do led to a lot of discussions. First, the students had to understand what the software was. Secondly, they had to find a use for it. The latter part was a bit like "The Company" in the case study: they were presented with the technology, here a program, and had to figure out what would be the best application for it. During the discussions, first the name changed, and, before putting an end to the discussion, the web address was bought. The students had to come up with a way to use it, and program a prototype for "the market" or "the function" in which they could use it.

Dako, presented by Nanna, is a manufacturer of cancer detection systems. After the biopsy is taken, it is sliced thinly and placed on rectangular glass slides, which are placed in a holding rack before going through treatment in a machine. In certain cases, you only have enough biopsy tissue for one test. If you destroy the slide while handling it, you may destroy the patient's chance for cancer detection. The students were given the task of finding ways to make this handling easier and hence safer for the patient. In the first phase, the students were limited by the existing products which were part of a system of machines. Therefore, it was either necessary to re-design the whole production line or to optimize within the given limitations. In the second phase, they had to work out how it should be done if there were no limitations and no constraints from the existing machinery and consumables. In this case, the participants had a physical product that they worked on.

The representatives of the companies were involved actively in the process. Their motivation was different. For Eric, it was a daily challenge, for Anders it was his own invention, and for Nanna it was a product which was a few months away from launch. The students worked with the companies and a group of teachers. For the first three days, there were four teachers present. How did the participants react? After the initial presentations, everyone tried to pitch in with ideas, asking questions to try to understand what was going on. The software problems had nothing tangible, whereas the Dako group demonstrated the rack and the glass slides, so everyone was handling the slides, placing them in the rack, taking them out, coming up with suggestions. What we observed was that all the participants, including the teachers, were hands on when it came to the group with the "machine". The groups with the software and the less tangible problem were talked to, but not with the same intensity. One did not have to have a deep knowledge of engineering in order to try out the rack. Neither did you need to understand for what purpose the rack was used to be able to contribute an idea. In contrast, the software problems demanded a lot more understanding, questioning and explaining to grasp the complexity of the problems. Therefore

the Dako group was getting attention from everyone, whereas the two other groups did not get the same attention. Having a physical product seemed to affect the way the participants interacted with the customer – in this case the company representatives. But all groups felt that they had to deliver: the challenge was a “real problem” and a solution would be appreciated, if not expected, by the customer, which was a serious driving force.

7.4 Time restrictions and funding

In the original case, time restrictions were imposed on the founding team through the contract with their customer. They had an agreement outlining what they had to achieve at each major stage gate. If they met this goal and their delivery was accepted, they were paid and could continue. As one of them expressed it, it was a question of basic technology. They just had to make it work, and you may add in the sense that they were a small group so they also had to learn to make up for the lack of people.

During the summer course, we could not work with funding. You may say that the participants were limited by having to make do with what they had, which was, so to say, the keys to the institution. This meant that they had access to anything the institution provides. The software groups could get hold of IT equipment and software, the Dako group, who used it the most, had free access to all labs and workshops, 3D printers, etc.

Time restrictions were imposed upon the participants by putting in presentations. After the first three days, they had to make a short presentation illustrating the results of the task clarification which they had agreed upon. Half-way through the course, they had a presentation internally where they presented their findings and received feedback from the other groups. Three weeks in, they had to present their solution to the companies. Through the whole course, they could contact the companies, though the representatives were only present for the first three days. The fourth week was spent preparing the documentation and taking the exam.

On going through the results, the following facts were noted. During the four-week course, the students were present close to 100 % of the time. While the companies were present for the first three days, the participants were working from 8 a.m. to 6 p.m., and again everyone was present. The involvement and the desire to produce were impressive, and the feedback from the companies was very rewarding. The presentation for the companies after three weeks showed that everyone had come up with a solution, which was commented upon by the representatives. Regarding the time aspect, it is worth mentioning that after the presentation Eric said: “I wish I could be as surprised as the others, but I met with the group last night and

heard their results. But I must admit, I did not expect them to have come up with more since yesterday evening!!!!” Between working on their solution and taking part in classes to support them in their process, the students were under time pressure. The need to deliver was there, and together with the close cooperation, it made the task more than just another study assignment: the students knew their contacts, and they had visited the respective companies.

As teachers, we had discussed the stage gates, and we were aware that the students may complain. However, we communicated very clearly that this was a course in which they would have to be there from 8 a.m. to at least 4 p.m. and probably longer. They anticipated a heavy workload, and we expected them to come up with a solution in order to finish the project. In return, they had access to teachers at all times. What we observed was that this approach worked. It fostered a first rate work ethic, which can be difficult for summer courses with warm weather etc. In the evaluation, no one commented on the work load or long hours, but did so on the chance to work just not for but together with a company and work with students from other areas of specialization.

7.5 How does the machine/object play into the work

First of all, it has to be repeated that we put the groups together not only based on who would be most likely to have the best qualifications for solving the challenge. We deliberately wanted to establish groups with as wide an engineering specialization base as possible. This meant that not all computer science students were in the software groups, and not all mechanical engineers were in the test machine group. The diversity of background would prove to be valuable, but the first couple of days it gave rise to quite a few “discussions” with the students. They understood the reasoning, but would so much rather be in a group where they expected to make the best contributions. Nevertheless, in order to get a cross-disciplinary function established, some of the participants had to work outside their comfort zone, which did not go without resistance. In the case of “The Company”, the founders all joined the founding group because their academic background was needed, whereas during our course this was not necessarily so. In the end, they all regarded it as a huge advantage that they had tried to work with people with other academic backgrounds. As our evaluation forms showed, they commented on this being the first time they had met and worked with people outside their own specialization.

It has previously been described how the physical product influenced the whole group: students, company representatives and teachers. The rack

and the slides from Dako were handled by all the participants – everyone tried to come up with ideas for how to solve the problem and tried to get into the loop of how it should be done in the future. Maybe because it was a lot less abstract than a software problem: it was easier to relate to, you could touch it, you could try to insert and extract the slides, and quite a few slides were broken in the process. Even though everyone used e-mail, it did not have the same attraction to be part of solving the problem of spam mail. When holding the slides etc. from Dako, the participants were handling a focal point and had something to center their discussions on. Ideas could be shown – students could go to the blackboard and draw up ideas, which is a lot more difficult if one wants to discuss spam filters. Somehow the object – you might even call it an actant -became alive. When the students handed their solution back to the company, they had used the 3D printer to produce a copy of their solution, based on the 3D drawing from the company. When they presented it, everyone wanted to try it, since everyone knew the problems with the original and wanted to try the new solution. Dako had been given a copy of the program for the design of the new rack, and could therefore print as many as they wanted, but it was very important for Nanna to bring back the original rack which the students had made. She found it important that her colleagues saw the real deal. So it was not just a piece of plastic - it was the first piece of plastic, it was the original. As such, it was wrapped in tissue paper and securely packed away. Does the object matter? Yes, it does. It has an ability to focus the discussion, it has the ability to attract the attention. Maybe software engineers feel the same about the abstract discussion of software, but for all other fields of engineering present, the physical product had an attraction, even for those who were not engineers. What we witnessed was some of the same pride in making a product work which was described by the founding group in "The Company".

7.6 The attraction of technology

Whereas everyone joined "The Company" because of the attraction of the technology, this is one of the areas where a course has its shortcomings. When placing students in groups, some were working within their field of specialization, but none joined a group based on what they found interesting. However, we did see the same process happening as was the case in "The Company". Over the duration of the course, we saw the groups coming together and, at the end, everyone had joined the team. Much in the same way as the founding team expresses it, when asked about it, the participants first played down the importance of the technology but eventually concluded

that the technology was important, even “sexy”. In planning a course as a part of an educational program, this subject has to be addressed better than it was during the summer course. We did, though, see an adjustment in the perception of the challenge from start to finish.

At the beginning of the course, some students felt that they had actually nothing to bring to the challenge they were assigned. In fact, it turned out that they did, since all the challenges had a focus on usability. As mentioned earlier, there were lots of talks between the teachers and the students the first couple of days, making sure that everyone was hanging in there and understood that they all had a part to play. The course was followed by a film crew, and only at the end, when released on youtube, did we hear what the students thought. For instance, a mechanical engineer, who had serious reservations at the beginning of the course, expressed on the last day that his group could only have done what they did because of the variety in the educational background of its members, and that “ the project – it has been a fantastic journey, from insecurity, from chaos to learning to knowledge. It has been a fantastic journey. I want to say I have gained so much from this project.” However, the quotation does not show any of the reservations from the start of the course.

You can develop an interest in a technology which is illustrated by the fact that despite their initial reservation during the course the student groups performed very well. However, what we learned from ”The Company” is that the founding team had fewer problems because of their joint interest in technology from the very start.

7.7 Knowledge gained from the Sommerhøjskole

First of all, when working with innovation, we need to make it real, we need a “real problem”. If we can create a situation where “real problems” present themselves, the students will take to it very passionately, and the willingness to work hard and learn is empowering both to the students and to the educators.

The initial case showed that having a customer gave more than money. It focused the innovation process: “the Company” did not get lost in RD, they made what the customer wanted. With stage gates along the way and with payment involved, the founding group became a high-performing team. The effect of having a customer worked out very well, when transferred to an educational setting. The effect of having an extremely close cooperation between the company and the students made the relationship between the two parts very close, not in the sense that they became cosy and friendly, but in that the students understood the importance of working with and solving

the problem. It was understood that it was not just a problem invented for the purpose of teaching, but indeed a very “real problem”, one which the companies had worked on for a long time and were still working on. This injected a lot of realism to the innovation process.

The student start-up had time restrictions and funding issues. During the course, the students were working under time restrictions, since the course provided a limited time-frame with deadlines. The consequence of not meeting the deadlines would be failing the course, which cannot be compared to going bankrupt, but it is still a significant consequence. Funding restrictions, on the other hand, were different. The groups were limited in manpower and in access to hardware or software in so far that if the institution did not have it and the company could not lend it to them, the students were unable to use it.

The machine/object and the technology which played such a big role in the start-up had a somewhat different effect. We saw that having an object seemed to be a substantial help for the group that had one. The software groups were a bit more challenged. If the aim were to test the effect of attraction of technology, the students should have been allowed to choose freely among the projects. However, that may have ruled out the diversity of academic backgrounds in the groups.

Entrepreneurship was not tested as part of the course program. It came up briefly when the group working with Accipio had presented their results in plenum, and had a chance to talk to the company. During the conversation, they were asked by Anders (who is a serial entrepreneur) if they wanted to go on with this project together with him, but no one acted upon it. Therefore, if entrepreneurship is to be an outcome, the set-up has to be changed.

The results

8.1 Introduction

This chapter will first in chapter 8.2 sum up the implications from the chapters on theory and how the theories have been used in the case, then address the results stemming from the case to see how theory and case have proved connected. An essential part of this is to see if effectuation can be seen in the case. The last part of this chapter is to see if the findings can be used in an educational program.

In chapter 8.3 a literature review is done on education and entrepreneurship, and entrepreneurship and PBL to solidify the foundation of what has been found with research, before addressing Problem and Project Learning – The Aalborg Model.

In chapter 8.4 the Principles of Problem and Project based Learning is addressed to see if these principles align with the findings of the conceptualization of Effectuation.

Finally in chapter 8.5 a suggestion for further program implementation with the purpose of supporting students in endeavour into entrepreneurship is described.

8.2 Results

8.2.1 Entrepreneurship

There seems to have been a show-down between the hero entrepreneur – the idea that entrepreneurs are a special breed of people, possessing special skills or genes - and the idea that entrepreneurship is more of a process, which by the way involves several people. Even though a lot of research has been done in order to describe the characteristics of the entrepreneur, this

approach has not been successful. On the other hand, it is yet to be seen if the more process-oriented theory exemplified by effectuation will endure. Effectuation sees entrepreneurship as a process of creating *a* company – not a creation of *the* company. Effectuation does not have the purpose of creating the best company possible, but the best company the particular entrepreneur is able to build now, within her or his limitations.

Effectuation sees the pre-firm phase as a process where the entrepreneur has to work with the following questions in order to establish the company:

Who am I?

Whom do I know?

What do I know?

How much can I afford to lose?

This approach is chosen because instead of a causal analysis – which is the case when making a Business Plan, effectuation on the other hand has some fundamentally different goals, which Sarasvathy describes as follows;

1. Affordable loss rather than expected returns
2. Strategic alliances rather than competitive analyses since strategic alliance makes the competitive analysis unnecessary
3. Exploitation of contingencies rather than exploitation of pre-existing knowledge
 - a a. When pre-existing knowledge, such as expertise in a particular new technology forms the source of competitive advantage, causation models might be preferable. Effectuation, however, would be better for exploiting contingencies that arose unexpectedly over time.

The basic assumption is that in a causal approach, the market exists with or without the new venture – and the task of the entrepreneur is to get as much of it as possible, whereas in effectuation, the market is created by the entrepreneur and the alliances made in the process. All of this leads to a very simple conclusion “To the extent that we can control the future, we do not need to predict it.” (Sarasvathy 2001a) So the goal of getting over the hurdle of starting the company is to get as much of what we normally predict about the future away from uncertainty and into the realm of control, since if we can control it we do not need to predict it. If we can control it, we have also eliminated the problem of uncertainty, which is the stumbling block for a lot of business plans. The conclusion is (Sarasvathy 2008) that the novice entrepreneur will favor a causal approach e.g. a business plan. Though, if lacking funds, he or she will tend to lean toward effectuation. In contrast,

an expert entrepreneur will be able to go back and forth between the two but will favor effectuation.

8.2.2 Innovation

Generation 1 and 2 models, presented innovation as a very sequential process: starting either with technology and R&D and ending up in the market or, the other way round, starting with market needs and ending with R&D in the market. The development of the product seemed very stage gate like, and is hence very sequential. However, as research and time progressed, the models became more and more focused on facilitating the process, adding more and more actors into it, as shown in Figure 8.1. The model was first introduced in chapter 4.3, as one of the latest innovation models (Berkhout, Hartmann et al. 2006). It shows the interaction between scientific exploration, market transition, technological research and product development. In order for it to function, someone has to create the interaction between the different areas. In the model, this innovation process facilitation is handled by the entrepreneur, much in line with the entrepreneurial thoughts first presented by Schumpeter and Drucker. Again, it is more of a cyclical model – opening up to iterations rather than promoting a sequential stage gate model, and again – it takes a lot of people to pull it off.

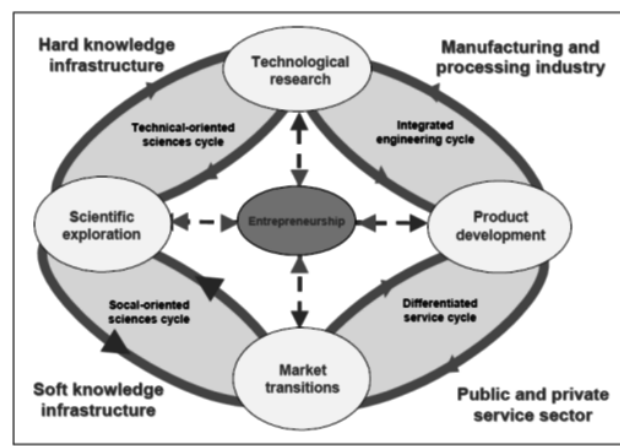


Figure 8.1: Systems model

8.2.3 Learning

The research of organizational learning has not brought many new insights since 1990, when Senge (Senge 2006) did his best to make sure that the

new management mantra “learning organization” would create visible results. However nothing much happened. The desire to create an organization which is a learning organization is still there. Today, learning is seen as an essential factor for any company to develop, though research has not come forth with a lot of knowledge about how it happens.

8.2.4 Creativity

The chapter pm creativity showed that a sharp definition of creativity is hard to come by. The term is applied loosely in several domains from arts to design of complex solutions. There are several classifications of creativity ranging from the big C – which is the superior skill within a field, to professional C – which is something that can be learned, and diminishing towards the lower levels of accomplishment. As a process, it is worth noting again that creativity has a connection to networks or groups. Hence, the idea that someone can do everything single-handedly seems no longer to be valid.

8.2.5 Team

Team has been a pivotal point for a large part of the theoretical foundation. No matter which theoretical area has been under scrutiny, the end result has continuously been that the focus of research and the entity of action has been a group or a team. Therefore, it was natural to look further into the theory behind groups becoming teams. Since teams are involved in all other areas of theory, it has been self-evident to examine their role in the other areas of theory.

Regarding teams, it is notable to see that being a high-performing team means using the team to solve problems. Also, a high-performance team is responsible for the team members’ learning (Katzenbach, Smith et al. 1993, Katzenbach, Smith 1993). Besides, it was previously described that the term entrepreneur has been expanded to a founding team, since each entrepreneur is dependent not only on his or her actual business partners but also on attracting the first employees. Even though the first employees may have no stake in the company, they are viewed as stakeholders in the process of building the company.

8.2.6 The cases

While “The Company” is the primary case which this study revolves around, an additional case was introduced, that is Venture Cup.

8.2.6.1 Venture Cup

Venture Cup has a long and winding history. In essence the organization has the following objective:

1. Motivation to become an entrepreneur
2. To shape the future high-tech growth companies

This is done through competitions, which ultimately require preparation of a business plan. There can be little doubt about the motivation generated by the organization, which attracts approx. 2,000 participants per year. Within the last four years, admission to universities has been between app. 23,000 and 30,000 students, the latter in record years. To get 7-10 % of admitted students each year to participate is a rather impressive number. Regarding the other goal, shaping the future of high-tech companies, the results are less impressive. Checking the list of finalists reveals only two companies that have become big and successful if a company which according to a source has been sold and hence ceased to exist can be included. Based on a look through the list of alumni companies in Venture Cup, no names seem to necessitate a change of the result, which makes it questionable if a business plan competition is necessarily the best vehicle for creating high-growth companies.

8.2.6.2 “The Company”

8.2.6.2.1 The role of Venture Cup for the company and Business Plan

Both founders of “The Company” describe the importance of Venture Cup as an initiator of the process. They state that they do not think that they would have started a company together, had it not been for the push of the competition. However, they did not do what the plan prescribed. They started the company while evaluating the market instead of waiting until they had a full business plan. Nor did they have very much funding in place. They started because they could not find anyone who was able to do what they were able to with the technology. The business plan, intended by Venture Cup as a vehicle for judging their potential and for attracting capital, was not part of the decision process. Venture Cup was a starting point and the reason why the two founders joined forces. To begin with, the prize money was the goal, which later became the source of financing. Initially, the business plan was a partial goal to be reached in order to participate. Later, some of it came in handy (since they started before they had a full plan) as a source of information for finding a customer in order to survive.

For the founding team, it is clear that the process of writing a business plan was a factor which started the company. Yet, the business plan as such was not a blueprint for the development of the company, although the areas they have turned to were suggested in the initial plan.

The business plan and the financial considerations created a feeling in the company that the business side was under control. Furthermore, the employees hired by the company later characterize the influence of the business plan as more articulated, compared to the founders and the early members of the founding team, who see the growth of the company as a more of a random development.

Over time, the business plan lost its influence on “The Company”, which was emphasized by the founder who was a business school graduate: “We do not need a 100-page plan. We know our customers and the markets.” Even though the team continued to work on the business plan after they founded the company, two years later they moved from a causal approach more or less directly to an effectuation-based approach, and stayed there.

8.2.6.2.2 Founding Team

On the surface, among the members of the founding team there were two areas of specialization, with business school graduates on the one hand, and the engineers on the other. But within engineering, the field of knowledge was stretched as far as possible. In the initial phase, there was only one person representing each area of engineering specialization, giving a very high importance to the input from each individual. As a result, there were no fall-back systems. As described, the importance of each member was high, and the possibility to spread knowledge on more people came only as the company grew. Even though the start-up is an engineering venture focused on technology, the relationship between not only the founders, but also all the members of the founding team is characterized by tremendous respect for each other’s capabilities and functions. The mutual respect in this cross-disciplinary field of work is evident in the statements by everyone. For instance, the economists have a very high opinion of the technical side, while the engineering side attributes a lot of their success to the fact that someone else was able to take care of business. Having these competences is described as very unique for the start-up and quintessential for its success. This stands in contrast to what is perceived as frequently happening in other high-tech companies and development-focused engineering start-ups, where focus on business and bottom line is not prevalent.

8.2.6.2.3 The Customers

“The First Customer” is significant in that they change the scope of the company. The founders want to sell them a quality control system, but end up with an order for initial manufacturing and production management systems. It must be added that this massive change in direction is considered possible by the founding team, because they are not bound by any venture capital to develop the technology for a specific application. Consequently, although the lack of funding is their Achilles heel, at the same time it constitutes their biggest advantage as they can change direction as they choose and do not have to have approval from their source of funding.

“The First Customer” is also special in that they are very involved in the development process. Which they are going to use the results from in order to change their whole production line, once the technology and systems are developed. If “The Company” is no longer a Venture Cup participant but a real venture, then the first order from “The First Customer” has a definite contribution to the development of the technology. “The First Customer” can walk away from the project with some loss of money. However, if they stay and succeed they have as much to win as the start-up. The dependency between the two is mutual.

“The Second Customer” has the same interest in the technology, but not the same control over the outcome if it becomes a success. Whereas “The First Customer” is working with the technology internally and in the production line, which does not affect their own relationship with the customer, if successful, “The Second Customer” will need to interact far more with their customers and the whole value chain. Whereas the first application leads to the creation of a better product without affecting the customer, the second application will affect the whole business model. The interest of “The Second Customer” seems to be there, although not to the same extent as was the case with “The First Customer”. The smaller industry commitment may be the reason for the lack of success.

The contract with “The First Customer” had a significant influence on the company, not so much financially but because of its consequences. As repeated several times, having a customer focused the development process. It was never a question of considering the needs of a more generic representative of a market, but what a specific paying customer wanted and required at the next stage gate. Even the funding, though huge for the start-up, was relatively small for the customer and companies like it. Securing the funding for the project also means that the start-up did not get lost in technology adventures but stayed focused instead. They did not continue just because

it was interesting, and no one questioned their spending.

8.2.6.2.4 Technology

As described in the chapter on entrepreneurship, technology was more than just a business opportunity for the start-up. It was a very essential part of why the first founder got attracted to it since it was the subject of his master's thesis. For the other founder, it became as interesting to him as it was to his partner after he did all the market research. When you listen to the business school graduates, they are as enthusiastic about the technology as the engineers. The latter term is used loosely since they have all sorts of backgrounds, including computer science, statistics etc. so the term *engineers* is used in "The Company" with reference to everyone working on and developing "the technology". When the engineers address it, they divide it into actual technology, hardware and software. To them, even the personnel making software, it is important that there is a physical product. It is essential that you build something that you can see, that something has been created and is now working. It is not just technology, a piece of software and some mechanical parts. It is exciting to make it work, and it is worthwhile to be the best at it. "The Technology" cannot be anything: it has to be "sexy", "exciting" or "new". All the words used to describe it suggest that it has to be interesting to the individual since for an engineer it is not just a job – they also invest their pride in making things work.

8.2.6.2.5 Motivation and learning

What motivates young people is the chance to get involved with the existing technology, and feel that they are among the best, and they can hold their own. Whether it is a narrative created in the company for mutual self-efficacy, or if it is genuinely a mutual respectful understanding and common opinion is difficult to judge, but it is a recurrent comment: "we have the best people", "with the highest marks" etc., which very much conforms with what Napier and Nielsen described as Mastery Within Discipline (Napier, Nilsson 2008).

What seems somewhat surprising in the case study is that this group of nearly all fresh university graduates is so reluctant to address learning within their area of specialization. When discussing management, running the business etc., everyone including the business school graduates agrees that they have learned a lot, but they all find that, when it comes to learning within their field of expertise, they are using more or less the same tools

for solving problems that they were taught at university. It would not be surprising if after changing three industries they said that they had brought the field forward, and hence learned, but according to the interviewees it is the same math, the same approach to programming, etc. as when they started. In retrospect, considering that they are doing a lot of research and some of them have that type of background it would have been better to ask if they could write articles for journals based on what they had done. If you are the best of the best, acknowledging that you are learning may be difficult, but creating new knowledge could be more acceptable.

Last, what motivated the founding team, who were young and inexperienced, was the possibility that they could actually get to work on things, and make decisions normally left to senior management, coupled with the possibility to show that they had what it takes to win.

8.2.6.2.4 Conceptualizing effectuation

Effectuation was a term used by Sarasvathy (Sarasvathy 2008) to explain the process of creating a new venture, when undertaken by expert entrepreneurs.¹ Sarasvathy also introduced hypotheses related to this new term, especially one regarding expert vs. novice entrepreneurs, which states that the novice will favor a causal approach to entrepreneurship but he or she will turn to effectuation when lacking resources. Conceptualization as a method was described by Henriksen, and can be understood as “not stating in advance what a phenomenon is – but rather, using the research process to find out what the phenomenon is really all about”. (Henriksen et al 2004) Sarasvathy needed to find a term for what she found expert entrepreneurs did that was inconsistent with a causal approach. This study has tried to give meaning to the term when dealing with novices. Dan says in the interview that what makes them special is their ability to effectuate, which means to get things done, instead of getting caught up in too much research and development. To effectuate means to act: meet the customers, find out what they want. Dan is using the term in its everyday or lexical meaning, without all the connotations that Sarasvathy adds to effectuation with her four basic questions: “Who are you?”, “What do you know?”, “Who do you know?”, “How much can you afford to lose?” Regarding the hypothesis that a novice will favor a causal approach, the case demonstrates that what starts the process is Venture Cup. As described previously, the purpose of Venture Cup is the promotion of entrepreneurship through a business plan competition. The final goal is the creation of high-tech, high-growth com-

¹ expert entrepreneurs have built several companies worth at least 250 million \$ US

panies. Everything in the competition is based on a causal approach. There can be no doubt that “The Company” is capable of making a business plan, considering how they did in the competition. However, the business plan had nothing to do with their start or their survival. What initiates the whole process is Venture Cup: Dan wants to take part in it but he lacks an idea for a product. Sarasvathy starts her characterization of the process with a more introvert description of who the entrepreneur is and what he or she knows. Writing up a business plan is not new to Dan, but the need for a product on which to base the company makes him consider his friends and acquaintances in search of someone who could offer a solution. Dan describes it as process that happens within minutes. He sees the competition advertised and decides that Poul could have the ideal product or idea on which to base an entry into the competition. In this case, the process is very fast. Dan already knows a person who can be a potential partner in entering the competition. When looking at the founding team, they all join “The Company” because the founders need their expertise since they lack knowledge themselves. Thus, we may argue that it is a consequence of posing the question “What do you know”? When the founders describe their initial search for capital, they recall that they contacted their bank and presented their idea for “the machine”. However, they did not bring a business plan. They borrowed what the bank thought safe to lend them, which was an amount that Dan and Poul found to be an acceptable risk. In other words, what they could afford to lose. The start of the company at the beginning of the competition made writing the business plan not so much a matter of planning the strategy, but describing the emerging strategy. The four basic questions of effectuation as well as the hypothesis that the novice entrepreneur will favor a causal approach but lean toward an effectuating approach when resources are scarce were all reflected in the case study. Today, even though there is a demand for a structural approach, the founders still rely on their knowledge of technology and their knowledge of the market. When asked if they would participate in a new start-up, the founding team was a bit reluctant and hesitant: they were concerned about making it financially. What had been such an easy decision when they had nothing appeared no longer as easy now that they were used to all the perks. When we use the term effectuation, there is no difference between the way expert entrepreneurs described in Sarasvathy’s study acted and the way the founders act now, when as owners of a very successful company they would qualify to be included in the original study. At the same time, it is noteworthy to see that the way the founders of “The Company” acted when founding it remains in perfect accordance with the way the hypothesis predicted novices would act when lacking resources. Effectuation is a way to act within your capabilities and overcome the hindrances such as a lack of capital and knowledge by entering into strategic

partnership with resource persons and customers.

8.2.7 Sommerhøjskole

For the Sommerhøjskole, the aspect of entrepreneurship was left out. But the following was tested,

- The importance of having a customer
- The importance of a close cooperation
- An interdisciplinary team

What needed to be addressed was what type of problem the founding team solved. Using the typology presented by (Henriksen 2011) (Henriksen, Norreklit et al. 2004), it was termed a Real Problem, which means a problem for which there is no given answer or solution. To accomplish that, problems were sourced with companies, acknowledging that they did not have the solution though they had tried. So, what was previously loosely termed as real problems, had now a theoretical foundation.

Given that the companies needed a solution and could not find one themselves, they were no longer the experts. Consequently, they could go into a dialogue with the students on an even footing, much in contrast to what is normally the case when students meet businesses.

The students at Sommerhøjskolen were given deadlines that corresponded to the stage gates, similar to the circumstances where the start-up had to deliver in order to continue to be funded. Certain tasks had to be solved according to the schedule. This also meant that when the students started working they knew that, for instance three days in, they needed to be absolutely sure that they understood the requirements of the company in exactly the same way, and that the solution they were trying to find would indeed solve the problem. Three weeks after start, they would have to present a solution. In doing so, the time pressure resembled one seen in the start-up, and the close cooperation was similar as well.

Last but not least, the students and the company representatives were equals when the facilitation/course took during the first three days.

This setup resulted in a work ethic which is seldom seen in an educational setting. The first days the students and the company representatives worked literally from early morning until evening, in 10-hour stints. This close cooperation is not experienced frequently when inviting companies to engage with students. In this case, it stressed the company's interest in getting a usable result.

Principles of Problem and Project Based Learning

9.1 Literature on education in entrepreneurship and PBL

In order to convert the findings into a better educational process, numerable literature searches have been made on different combinations of entrepreneurship and PBL. These searches have been made in the hope of finding a paramount article which could open up the subject. Unfortunately, no matter what the search words, very few results were obtained. A search in Scopus using words PBL + Entrepreneurship gave 14 hits, of which only two had been cited by others: Problem-Based learning approach in accomplishing innovation and entrepreneurship of civil engineering undergraduates. (Chau 2005) and A problem-based learning approach to entrepreneurship education (San Tan, Ng 2006). A scalable problem-based learning system (Hanke, Kisenwether et al. 2005) has been cited 7 and 11 and 0 times according to Scopus, whereas according to Scholar they have been cited 10 and 52 and 24 times. The search was extended into all sorts of combinations of PBL + Entrepreneur/ship education, pedagogy, didactics etc., but no progress has been achieved. When researching entrepreneurship as a subject to be taught, the results are different. The number of articles is vast, and they attract a lot more interest from others than the subject of teaching it based on a pedagogical principle. In his article, Katz (Katz 2003) describes the entrepreneurship education in the U.S. from 1876 to 1999, so the subject has been researched. Katz notes that he includes everything in the term entrepreneurship since this is how the public understands it, and without any sub-specialties, the list becomes more comprehensive. (See

Figure 9.1 Growth in the number of endowed positions and schools with entrepreneurship courses.)

The same effect can be seen elsewhere e.g. in Europe. (Katz 2003). The number of courses in entrepreneurship is growing, the number of endowed positions is rising, the number of journals is increasing and the number of Ph.D. fellows is getting higher. The demand for entrepreneurship education outside business schools is growing. After having researched the development of entrepreneurship education over 125 years, and including everything the actual scope of education is limited to:

- “Two widely recognized and consistent approaches: entrepreneurship (wealth-creation focused courses) and small business (form-creation focused courses);
- For each approach, there is considerable standardization across the industry (notably the reliance on the number, type and teaching approach to courses) (Plaschka and Welsch, 1990; Solomon et al., 1994);” (Katz 2003)

What they understand with approaches is basically focused on what type of knowledge/subjects are taught or ”what pedagogies are most appropriate for the transfer of entrepreneurial skills” (Solomon, Weaver et al. 1994). Sexton and Upton (Sexton, Upton 1987) propose that courses in entrepreneurship should be less structured than normal courses, giving the students room to make decisions as well as to search for questions and answers: “In summary, entrepreneurship students can be depicted as independent individuals who dislike restraint, restriction and the routine. They are capable of original thought, especially under conditions of ambiguity and uncertainty. Many of them need to develop better communication skills and to become more aware of how other perceives their behavior.” Beside the fact that they are entrepreneurship students, and as such considered to be special, the interesting thing is that the problems they should be presented with are problems that demand novel solutions. Summing up, they describe the course to be “Basically, the entrepreneurship course should be unstructured and pose problems requiring novel solutions under conditions of ambiguity and risk. It should also stress independent study rather than group efforts. A ”frustration factor” (in the form of inadequate data availability) should

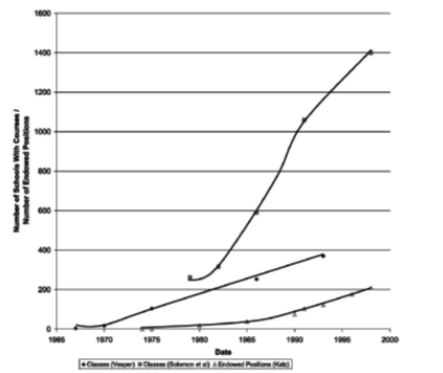


Fig. 1. Growth in number of endowed positions and schools with entrepreneurship courses.

Figure 9.1: Growth in the number of endowed positions and schools with entrepreneurship courses

also be included as a barrier to the successful completion of class projects. “(Sexton, Upton 1987) What is worth noting is that there has since been a change in the position showing that entrepreneurship is no longer considered a single man’s sport but very much a team effort.

The aim of research in entrepreneurship education has not only been to create more of academic positions and courses. A lot of attention has been given to the effect of the education. However, there is a fundamental problem in handling it, based on a very basic lack of agreement: “The lack of a clear consensus on the definition of an entrepreneur contributes to the confusion; it is therefore, understandable that the content of entrepreneurship education and training programmes varies according to the trainer’s personal preferences as to definition and scope. Some programmes stress practical application at the expense of conceptual development, while still others tend to emphasize planning issues.”(Garavan, O’Cinneide 1994)

Discussions

of what and how to measure have been many. (Gorman, Hanlon et al. 1997) Measuring the progress of entrepreneurial education (Vesper, Gartner 1997). Attempts to develop models for structuring the research have also brought forth a few publications, such as Jonnison (Johannisson, Landstrom et al. 1998, Johannisson 1991) and Fayolle (Fayolle, Gailly et al. 2006). In the model by Fayolle, the aim is to see how the theory of planned behavior and entrepreneurship education programmes can be evaluated.

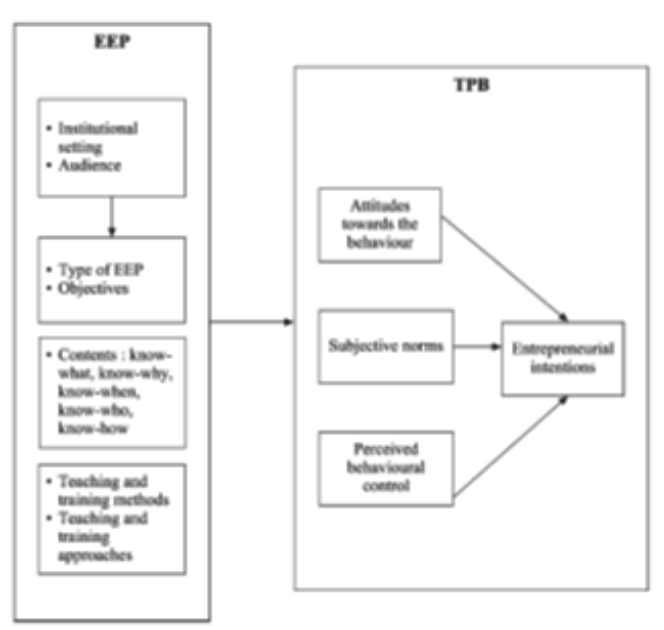


Figure 9.2: EEEP, assesment model Fayolle 2006

In the model by Fayolle, the aim is to see how the theory of planned behavior and entrepreneurship education programmes can be evaluated.

Others like Krueger argue that we should focus on how knowledge is created. He views this as the core, of understanding. The starting point is in the difference between a novice and an expert entrepreneur, and how their knowledge content and structure changes see Figure 9.3 Constructivism and Entrepreneurial Cognitive Development. (Krueger Jr 2007a)



Figure 9.3: Change in knowledge content and structure

In the theory of constructivism and entrepreneurial cognitive development, Krueger Jr (Krueger Jr 2007a) makes a point that “As individuals move from a more novice entrepreneurial mind-set toward a more expert mind-set, that movement is reflected in significant changes in deep cognitive structures, punctuated by critical developmental experiences.”

Krueger goes on to view the development of pedagogy as illustrated in Figure 9.4, The Evolution of Modern Pedagogy: A simplified view

The Evolution of Modern Pedagogy: A Simplified View

Key focus of pedagogy	Key assumption	Example of key tool
Teacher-centered	Teacher transmits to passive students	Memorization (lectures on entrepreneurial facts)
Teaching-centered	Recognizes learning as a process	“Skills & Drills” (e.g., writing business plans)
Learner-centered	Learners have “ownership” of learning	Case studies (e.g., assessing business plans)
Learning-centered	Learning is situated, students & teacher alike	Problem-based learning (e.g., self-managed field projects)

Figure 9.4: The Evolution of Modern Pedagogy: A simplified view

“Consider too, the very nature of problem-based learning. We know that problem-based learning enhances students’ entrepreneurial thinking to a remarkable degree, even showing evidence of changing knowledge structures in a few months (e.g., Krueger, 2001; Souitaris, 2005). However, the particular value of problem-based learning (PBL) in entrepreneurship pedagogy is that PBL requires learners to move from answer-finding to question-creating, to take personal (cognitive) ownership of their projects. Faced with very high uncertainty, extreme time pressures and competing demands on their time and effort, problem-based learning mirrors what an entrepreneur faces on a daily basis. As students proceed, their reflections invariably lead

them to that realization: the necessity for further improving their personal role identity as an entrepreneur (“It would be difficult for me to sustain any mental prototype of ‘entrepreneur’ that does not include ‘me.’”). If we are therefore, to assist novice entrepreneurial thinkers to become experts, we need to focus some of the increasing research interest in entrepreneurial cognition to address central questions of how expert entrepreneurs differ, not just in terms of surface knowledge and skills, but in how deep structures affect how they think” (Krueger Jr 2007a). (Krueger2007a) Unfortunately Krueger has not published more on this subject, nor has a direct contact to Krueger brought forth more information. The connection between entrepreneurship and PBL apparently needs further research.

“One future uncertainty is the form or forms of entrepreneurship education that dominate in the new century. The next new paradigm could come from anywhere on the globe, emerging from the new infusions of culture, business settings and institutional influences. For the 20th century’s history of entrepreneurship education, the world turned to America for inspiration. For the 21st century version, the world could turn anywhere.” (Katz 2003) For that, let us turn to PBL – the Aalborg Model.

9.2 Principles of Problem and Project Based Learning

The purpose of this chapter is to analyze the model of Problem and Project Based Learning The Aalborg PBL Model, as described in Principles of Problem and Project Based Learning The Aalborg PBL Model (Barge, Universitet 2010). Since this is the description which is agreed upon within the university. Aalborg University was built upon PBL from the very beginning. PBL has been the subject of research in works such as ”On Campus PBL” (Henriksen), ”PBL the Aalborg Model” (Kolmos, Krogh et al. 2004), ”Engineering skills and bildung” (Christensen, Henriksen et al. 2006), ”Process competencies in a problem and project based learning environment” (Du, Kolmos 2006), ”Research on PBL practice in engineering education” (Du, de Graaff et al. 2009) , ”PBL and the Question of Real Learning (Henriksen 2011). This is in no way a comprehensive list. Aalborg University is also heading The UNESCO seat of PBL.

The Aalborg PBL Model has seven definitions of terms and nine principles. The following section will present a discussion of the extent to which they hinder or support the application of the findings in the Aalborg PBL Model. In Appendix XI. Principles of Problem and Project Based Learning: The Aalborg PBL Model (Barge, Universitet 2010), the author has underlined what could have an impact both positive and negative on implemen-

tation of innovation and entrepreneurship into PBL as it is implemented at Aalborg University.

9.2.1 Definitions of terms

9.2.1.1 Problem

The Sommerhøjskole demanded the need for a classification of a problem, the classification used was made by (Henriksen 2011) (Henriksen, Norrek-lit et al. 2004). Their classification included a “real problem” meaning a problem, which does not have a known answer, this definition is not used in the Aalborg Model (Principles of Problem and Project Based Learning: The Aalborg PBL Model). The Aalborg Model states that “A problem can be theoretical, practical, social, technical, symbolic-cultural and/or scientific and grows out of students’ wondering within different disciplines and professional environments.” As can be seen there is a lack of a “Real Problem”, this may have to do with the demand for the problem to be exemplarity, see chapter 8.4.1.3. but if Innovation has to be part of Entrepreneurship, then this must be accommodated, otherwise innovation can at best only be an incremental innovation, and as such one for which it can be expected that a solution can be found.

9.2.1.2 Project

The understanding of a project undertaken by the students, is very much in alignment with the findings of this study: a project is complex, it must be planned and managed, it must be carried out in people’s surroundings, etc. The planning and managing are skills which can be well used in a start-up, together with the commitment to fulfilling a goal within a limited timeline. However, where the understanding of a project best support the goal of innovation and entrepreneurship is the fact that a project involves “an interdisciplinary approach in both the analysis and solving phases”. This opens up for all subjects within the students chosen area of study and for cross-disciplinary interaction with other specializations, which was highly valued by the students participating in the Sommerhøjskole.

9.2.1.3 Exemplarity

As mentioned previously, the lack of freedom or room to manoeuvre in an educational setting may be caused by the need for exemplarity. The Aalborg PBL model defines exemplarity firstly as “selecting relevant specific learning outcomes and content/scientific knowledge that is exemplary to overall learning outcomes.” The second part of the definition states that “a problem

needs to refer back to a particular practical, scientific and/or technical domain.” If innovation cannot explicitly specify the learning outcomes, or the scientific knowledge necessary to possess in advance, then the educational demand for exemplarity can become a stumbling stone for working with innovation. A consequence can be that only incremental innovation can be addressed in an educational setting, where the learning outcome needs to be controlled.

9.2.1.4 Team

Team theory was addressed in chapter 4.7. It showed that a group of people can become a team if they work on it and understand the demands for being a team. The formulation “A team is a group” shows a lack of acknowledgement of what can be achieved by putting effort into turning a group of students into a team, especially when considering that one of the demands for a high performing team stipulate that they are mutually responsible for each other’s learning. Underestimating the need for a group to become a high performance team, where the team is responsible for members learning, means that pedagogical set-up is not fully exploited.

9.2.1.5 Supervisor

The role of a supervisor is normally held by a member of faculty, who has to function as a resource for groups of students as well as an advisor or a facilitator. Therefore the supervisor could be the key to successful work with innovation and entrepreneurship. At the same time, the supervisor may be a hindrance if the person perceives it as unbeneficial for achieving the academic goals.

9.2.1.6 Project Courses

The project courses support the theme of the semester, as well as educating and preparing the students for working with it.

9.2.1.7 Study Courses

In this context study courses are the foundation for the curricula of the semester, Though not for the theme. It is up to the students and supervisors to integrate the two. During the Sommerhøjskole and the Sommerkursus, we saw that the study course may not have any relevance to the problem, and may end up as add-on to the project/semester. The reason was that we could not foresee the need for courses nor could we span the diversity, which

is the weakness or challenge of integrating innovation and entrepreneurship in a semester.

9.2.2 Educational Vision

A Problem orientation:

That the university has a problem orientation and sees it as the basis for the learning process is noteworthy since working on defining the problem, was the key issue for fostering entrepreneurial capacity and seen as essential according to Krueger (Krueger Jr 2007b).

B Project organization:

The project and the problem are the basis for the students' learning. Looking at the definition, it aligns nicely with what happened in "The Company" Company", where having an order from a customer focused the work effort and brought deadlines or stage gates into how the founding team worked, and the project focus was regarded as strengthened.

C Integration of theory and practice:

This approach is very important for implementing the findings. When interviewing the founders and the members of the founding team, they stressed the importance of doing it for real, of using their theory in practice. One of the founders said that had he had practical experience when studying for his master's degree in financing, it would have made so much more sense, and he would have learned more.

D Participant direction:

This mean that the students define the problem and make the decisions to complete the project. When working with a customer or a company, both the founding team and the groups in the Sommerhøjskole had to take full responsibility toward the companies involved. Even though they could not entirely make decisions based on their interest, the involvement had a huge impact on accepting responsibility for coming up with a solution.

E Team-based approach:

Once more, it must be stressed that the goal must be to create high performance teams, as this will help the learning process. In practice, we saw that the founders of "The Company" and the founding team stressed the fact that they did it together, and would only do it again as part of a team. This training must be considered invaluable.

F Collaboration and feedback:

In an educational setting, the critique comes from peers and supervisors, whereas in a start-up it comes from colleagues owners and customers. It shows that training based on interaction, and communication is important. (Sexton, Upton 1987)

9.2.3 Curriculum

The curriculum outlines how in a PBL setting, the students are to achieve the intended learning goals. The project comprises app. 50% of the semester work, and including project courses app. 75%. The importance of choosing a topic as a vehicle of learning is very high. In “The Company”, the founder studying engineering was driven by his interest in the technology, and the part of the founding team coming from “engineering”, were driven by their interest in the technology. They found it exciting, sexy etc. In the case of the Sommerhøjskole, the students had no choice since they had to work on what they were assigned. In a relative short time, the interest grew at the same time as the desire to solve the challenge increased. A balance between curriculum and making the topic exciting and sexy has to be achieved.

9.2.4 Students

The PBL model stresses the importance of the students working in teams, as well as of collaborate work and interpersonal relations. Not only do the participants get the academic knowledge, but also they are taught in a way, which will help them both as students, but also throughout their career. Somehow, the question of “who is an entrepreneur”, or an innovator is always lurking in the background. Since the purpose of this study, was to conceptualize effectuation, and through that gain knowledge of how to “fold innovation and entrepreneurship” into educational programs it has to be noted that the goals of giving the students strong project management skills, and an ability to show a high level of support for each other in academic work are all desirable competencies in an entrepreneur.

9.2.5 Faculty

The descriptions of responsibilities of faculty regarding strict academic demands are not important in this context. The further roles as a result of PBL such as “problems with the collaborative process, intra-group conflict, project management, etc” stress the additional role due to the pedagogical method. This role must be taken very seriously by the faculty. What was learned from Sommerhøjskole where the teachers had other functions than

that of giving lectures, makes the need for yet another role evident. In the Aalborg model, this is described as “They are aware of appropriate levels of direction in the process of advising groups (i.e. not directing student work, yet facilitating students’ progress). This role is essential if the students are given the possibility of working on real problems, as neither the students nor the members of faculty know what choices to be made.

9.2.6 Assessment of students

One problem in assessing the progress of students arises if they succeed in finding a real problem, within the theme of the semester, but are unable to come up with a solution. Most educational systems are efficiently testing knowledge “given to” the students, but how to assess learning when there is no “result”? this means that the process has to be evaluated, especially when faculty members from other institutions are involved, which may be a problem when other pedagogical principles are involved.

9.2.7 Resources

“Classroom and laboratory space are provided as required by study courses and project courses”. It is a disadvantage that these facilities are only available for courses, since the effect of having access to all sorts of laboratories, was evaluated as a huge benefit by the students on the Sommerhøjskole. The element of prototype building and testing in innovation as part of entrepreneurship, should not be underestimated neither as a motivation nor as a learning tool.

9.2.8 Program administration

”The institution facilitates inter-program and inter-faculty (school) collaboration on project work.” The possibility to do interdisciplinary work with innovation and entrepreneurship is definitely a huge advantage if not a prerequisite. It is much desired by students, and must be enhanced.

9.2.9 External relations

What we learned at the Sommerhøjskole only stresses that the close cooperation between educational institutions and other organizations, e.g. companies is essential in order to bring theory and practice together.

9.2.10 Educational research

Studies such as this have to be seen in the context of educational research, which poses the following elements.

- A Document the PBL model for both internal and external purposes
- B Develop an internal system for improving the model
- C Document current and emerging local practices
- D Relate contextualized educational practice to theory
- E Relate data and research findings to other international studies

9.3 What next

As it has been shown, we can make the students work with innovation in a PBL setting also it is possible to be successful when doing it. Then how do we get them the last bit of the way, that is instead of solving “real problems”, to turn them into entrepreneurs or entrepreneurial teams.

Addressing the problem of turning the students into entrepreneurs, it seems that all the parts are there, and it is a question of putting them together in the right way. It may be viewed as a combination of the following players:

- Supervisors
- Students
- Companies(Customers)
- Challenge(Opportunity)

In his work “Pedagogy of the Oppressed” Freire (Freire 2000) addresses the same old approaches which were mentioned by Krueger (Krueger Jr 2007a). Freire addresses the way teaching was viewed, educators are the knowledgeable whereas the students are basically illiterate entities who need to be taught, and have nothing to bring to the learning process. He describes it as a banking model where the educator deposits knowledge in the mind of the student, and withdraws it at exams. The student is taught the answers not in order to work with posing questions or refine problems. When it comes to innovation, Wagner (Wagner 2012) states that at four, children ask all sorts of questions, whereas by six and a half they have stopped doing it as they learn that teachers want correct answers not provocative questions.

By the time they approach working life, they have had all curiosity drummed out of them. It is therefore, extremely important that educators, being representatives of core competencies within their field of acknowledge that the relationship between them and their students should not evolve into the banking principle which is so oppressive. On the other hand, as described in the Principles of Project and Problem-based learning (Barge, Universitet 2010) the students, have to, take upon them a more active role, where they accept responsibility for their own learning.

The interaction between the companies/customers and educational institutions it tends to occur either in a research situation, where the knowledge inside the university is bigger than the knowledge outside in the company. This cooperation is typically carried out between peers, but when the company is engaged to help bring practice together with theory, the balance tips and the company becomes the educator, the holder of all valid knowledge which creates anything but a meeting of peers. When looking at the company as a customer, as was the case between “The Company” and “The First Customer”, then the balance is in place. Despite the team being very young, most of them not yet out of university, the interactions between the two teams were those of equals. During the Sommerhøjskole this was attempted, and achieved by having the companies bring a real problem, one they had not been able to solve themselves, and by having the representatives work together with the students, and participating in the same education to help prepare them for working on the problem. However this did not open up for the students to be entrepreneurs, except the case of Acipio.

How could this problem be solved? Or rather, where should we search for answers? It seems that the parity between students and companies on the one hand, and founding team and customer on the other, resembles each other, and that this could be an area to be investigated. A course could be built where all three parts enter as equals or peers: the students, the companies and the faculty members. We should keep in mind that what is lacking is still entrepreneurship. The solution might lie in creating an environment where the students meet companies who are not only posing assignments, but also instead of posing as such really are potential customers. The Faculty has to keep in mind that even though everything has been done to meet all the criteria for the semester theme, the project courses and the study courses, not everything will be covered, and the faculty involved may not have all the competencies necessary.

The idea behind this model is that if the Students and the companies can meet on equal terms, based on the same interest in a given real problem, then neither part will know what problems will arise nor if they have the capabilities to solve them. So the common interest/challenge has to act as a driving force for a common purpose.

Based on the first Sommerhøjskole, where the companies came based on an interest to learn about innovation and prototyping, we could imagine a scenario where the interest was more generic, or rather less focused. The subject could be crisis management. With this as a subject neither the companies nor the students or the faculty may claim



Figure 9.5: Potential Pedagogical setup

core competencies, but bringing in all relief organization, Red Cross, Save the Children, Caritas, Unicef etc. we would deal with experts in crisis management. Who face problems of all sorts, from practical problems to real problems. In this array of problems, the companies may have patents or access to some part of a technology which could relieve the situation. Combining that with the students and their interest in the technology might make the company representative just as intrigued by the problem and want to participate in finding the solution. In any case, we have created very much the same situation as with “The Company” and “The First Customer”, and in this case in contrast to the first Sommerhøjskole, the students would retain intellectual property right to their innovation, and through that get that one step closer to becoming an entrepreneur.

Appendix

10.1 I. Questions for founders

Først tak fordi du vil være med i mit Phd projekt. Som du måske ved, er jeg lektor på ingeniørhøjskolen, og det der interesserer mig er feltet læring – team og iværksætteri i virksomheder som jeres. Det der har min helt specielle interesse er at det I har gjort og forhåbentlig stadig gør, skal vi have ind i vore uddannelser. Det jeg tror på er at det mest naturlige sted at lære det, er hos dem der gør det med succes. Så jeg vil meget gerne høre jeres historie. Det er naturligvis fortroligt alt det du fortæller mig, og kommer kun videre som anonymt data. Jeg vil gerne starte med starten af virksomheden.

IVÆRKSÆTTERI Founder Hvordan endte du med at stifte dette firma kan du beskrive de overvejelser du havde omkring hvem der skulle eje firmaet

Hvilke økonomiske overvejelser gjorde du dig

Hvordan fik du forbindelse til din partner

Hvilken forbindelse havde du til de første medarbejdere

TEAM Founder Hvordan fik i arbejdet med gruppen til at fungere

Hvordan er din opfattelse medlemmernes funktion

Hvordan blev beslutninger truffet om hvilken retning løsningen skulle tage

Du kan eventuelt fortælle om samspillet i gruppen i en kritisk situation

Hvordan husker du samarbejdet de første år

Oplevede du at de øvrige bidrog til ændringer i projektet

På hvilke måder blev produktet et andet end du havde tænkt dig - og hvem bidrog

Har dette tætte samarbejde ændret sig siden da - kan du give eksempler på før og nu

Læring Founder Hvad har du lært ved at starte din egen virksomhed

Hvad er det vigtigste du har lært indenfor din faglighed (3dscan/datatransmission)

Hvordan taklede I manglende viden i opstartsårene

Hvordan har du lært om virksomhedsdrift - teknologi

Hvem havde lead på søgning af viden for at bringe projektet videre

Kan du give eksempler på forhold hvor læring var nødvendig

Hvad betød teknologien .- at det var 3D skanning

10.1.1 I b Questions for founding team

Hvordan endte du med at gå ind i et nystartet firma

kan du beskrive de overvejelser du havde omkring hvem der ejede firmaet

Hvilke økonomiske overvejelser gjorde du dig

Hvordan fik du forbindelse til virksomheden

Hvilken forbindelse havde du til ejerne

Er ansættelsesdatoen i overensstemmelse med hvornår du begyndte i virksomheden

TEAM Founding Team

Hvordan fik I arbejdet med gruppen til at fungere

Hvordan er din opfattelse af medlemmernes funktion

Hvordan blev beslutninger truffet om hvilken retning løsningen skulle tage

kan Du eventuelt fortælle om samspillet i gruppen i en kritisk situation

Hvordan husker du samarbejdet de første år

Oplevede du at I bidrog til ændringer i projektet

På hvilke måder blev produktet et andet end du havde tænkt dig da du begyndte

Har dette tætte samarbejde ændret sig siden da - kan du give eksempler på før og nu

Læring Founding Team

Hvad har du lært ved at være med i et start up

Hvad er det vigtigste du har lært indenfor din faglighed (3dscan)

Hvordan taklede I manglende viden i opstarts årene

Hvordan har du lært om virksomhedsdrift - teknologi

Hvem havde lead på søgning af viden for at bringe projektet videre

Kan du give eksempler på forhold hvor læring var nødvendig

Hvad betød teknologien .- at det var 3D skanning

10.2 II. Procedure for recording

Inden opstart af interview skal telefon forberedes. I musik Under mikrofon/optager Valg Indstillinger Vælges hvor lydklippet gemmes Tast ok Derefter tilbage.

Zoom tændes og opstart af optagelse fås ved tryk på rød punkt på forside – vær opmærksom på at den skal lyse.

10.3 III. An integrative model of entrepreneurial inputs and outcomes

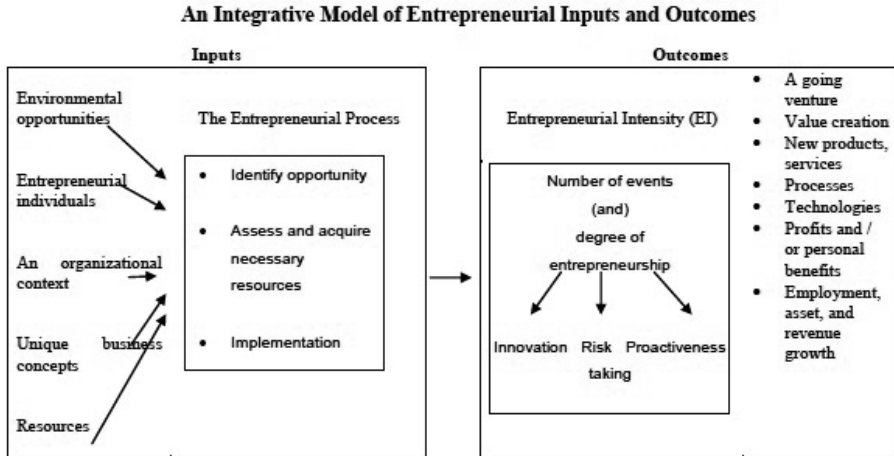


Figure 10.1: appendix 3

Source: Michael H. Morris, P. Lewis, and Donald L. Sexton, “Reconceptualising Entrepreneurship: An Input-Output Perspective,” *SAM Advanced Management Journal* 59(1) (winter 1994): 21-31. In (Kuratko, Hodgetts 2008)

10.4 IV. Entrepreneurial Assessment Approach

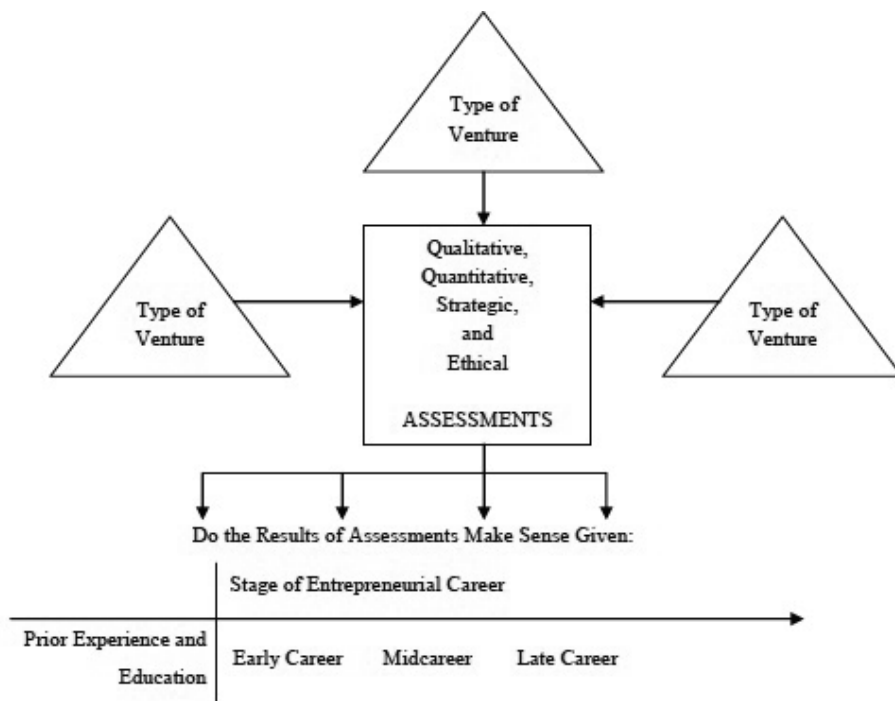
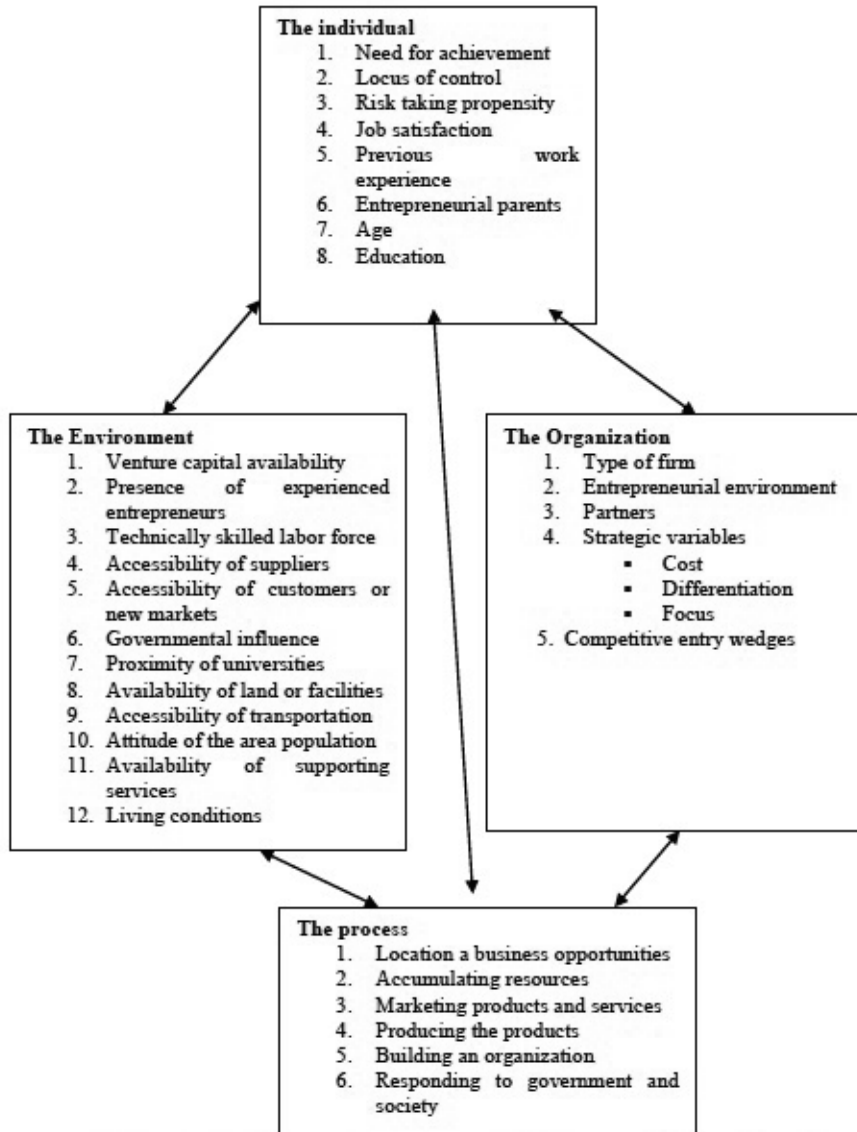


Figure 10.2: appendix 4

Source: Robert C. Ronstadt, *Entrepreneurship* (Dover, MA: Lord Publishing Co., 1984), 39 In (Kuratko, Hodgetts 2008)

10.5 V. Variables in New Venture Creation

Variables in New Venture Creation



Source: William B. Gartner, "A Conceptual Framework for Describing the Phenomenon of New Venture Creation", *Academy of Management Review* (October 1985): 702.

Figure 10.3: appendix 5 (Gartner 1985)

10.6 VI. Timmons Model of entrepreneurship

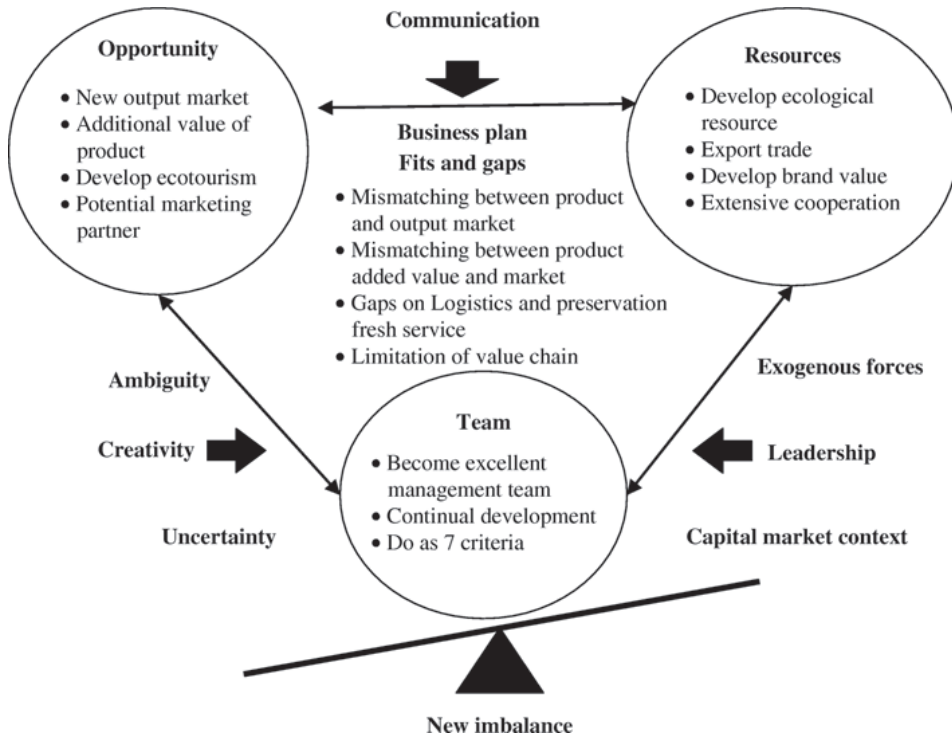


Figure 10.4: Appendix 6

(Timmons, Spinelli 1999)

10.7 VII. Kirketerp

	X-tilgang (faglig kompetence)	Y-tilgang (personlig kompetence)
Pædagogisk tilgang	Bottom-up (disciplinorientering)	Top-down (problemorientering)
Læringsbegreb	Kumulativ (overførsel)	Relationel (facilitering/vejledning)
Sammenhæng mellem teori og	Handling forudsætter	Viden skabes gennem praktiske erfaringer
Logikker Ontologi	Causation (viden som en global forretningsplan) Verden som grundlæggende	Effectuation (viden som små skridt af fuld kontrol) Verden som grundlæggende
Evalueringsformer	Reproduktion af viden, fokus på analyse	Evne til at demonstrere foretagsomhed,

Figure 10.5: Appendix 7

Figur 1: Forskellige tilgange til entreprenørskabsundervisning som henholdsvis personlig og faglig kompetence.
(Kirketerp) p. 21

10.8 VIII. Timmons Sea-Changes

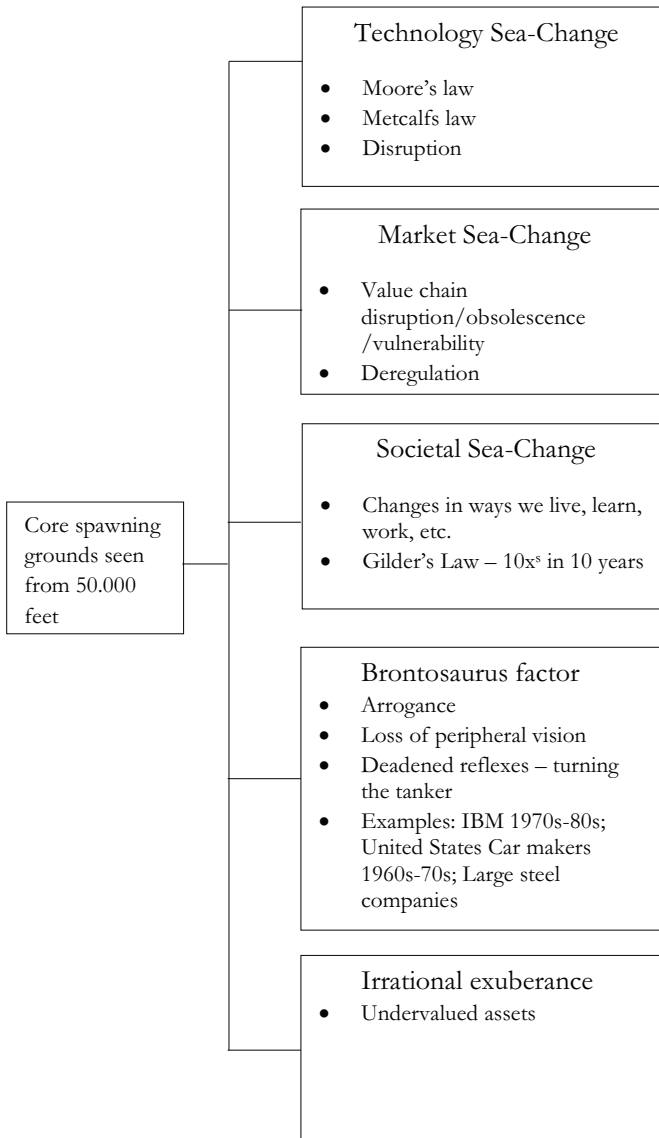


Figure 10.6: Appendix 8

(Timmons, Spinelli 1999)

10.9 IX. The theory of effectuation

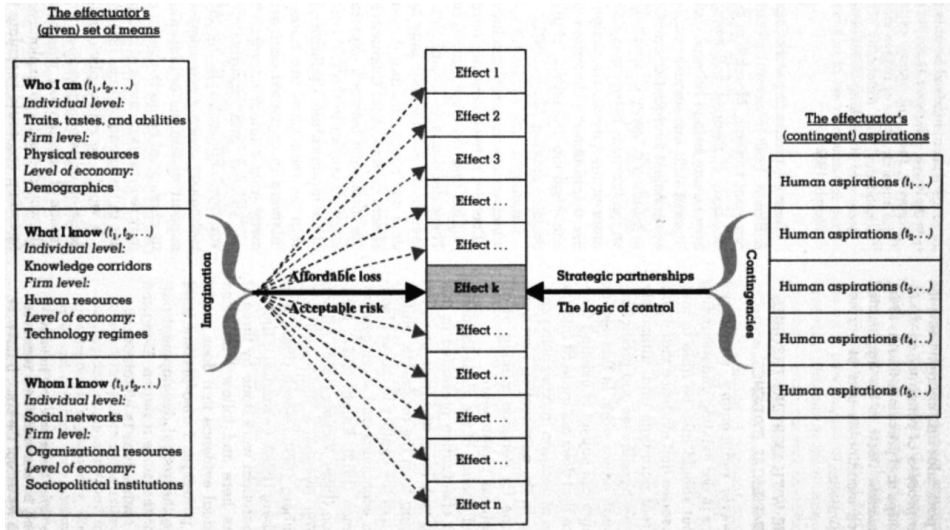


Figure 10.7: Appendix 9

10.10 X. Timmons model of entrepreneurship

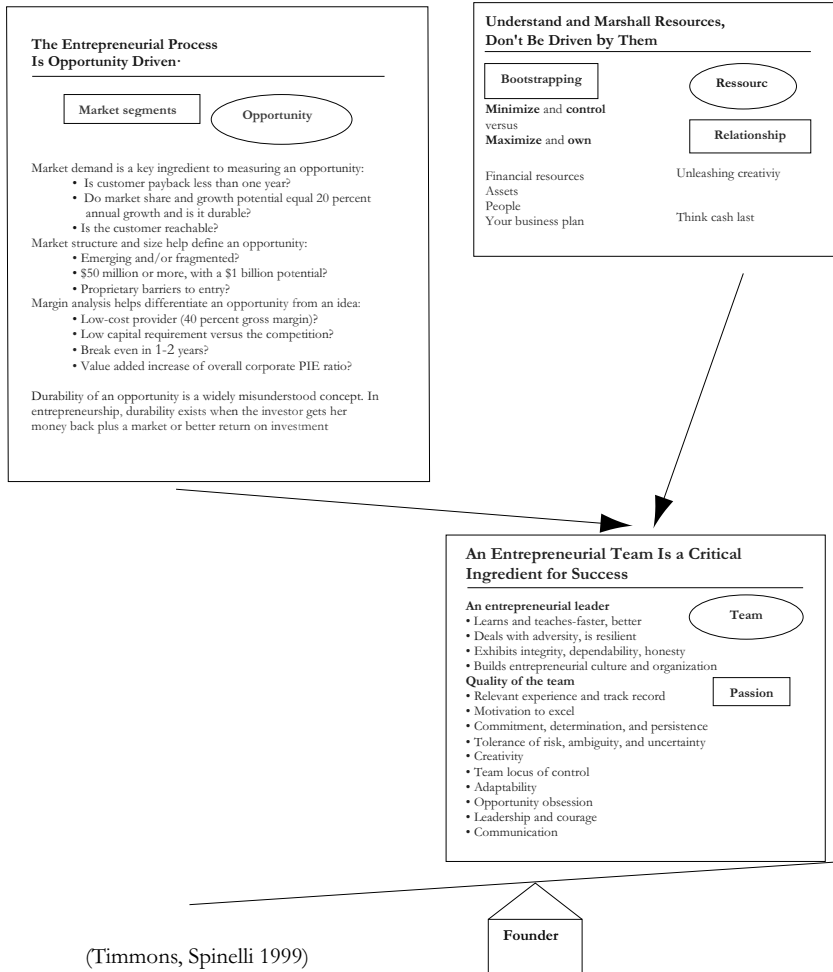


Figure 10.8: Appendix X

10.11 XI: Excerpts from Principles and Project Based Learning

10.11.1 Definition of Terms

Any discussion of project-based or problem-based learning is quickly complicated by the use of specific terms that have a variety of definitions and understandings in the broader literature. The following terms are defined for the purposes of clarifying their use in the Principles of Problem and Project Based Learning.

Problem: A problem can be theoretical, practical, social, technical, symbolic-cultural and/or scientific and grows out of students wondering within different disciplines and professional environments. The problem is the starting point directing the students' learning process and situates the learning in a context. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

Project: A project is a complex effort that necessitates an analysis of the target (problem analysis) and that must be planned and managed, because of desired changes that are to be carried out in people's surroundings, organization, knowledge, and attitude to life; it involves a new, complex task or problem; it extends beyond traditional organizations and knowledge; it must be completed at a point in time determined in advance. Projects are necessarily diverse with regard to scope and specific definition. No one specific template or standard exists to define "sufficiency" but rather, these determinations are made within each programme.

Exemplarity: Exemplarity is a principle of selecting relevant specific learning outcomes and content /scientific knowledge that is exemplary to overall learning outcomes. That is, a problem needs to refer back to a particular practical, scientific and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

Team: A team is a group, sharing and working closely together in design, decision making, analysis and reflection. The binding cooperation of members on successful completion of the project is an essential component of the overall approach to learning.

Supervisor: The role of supervisor is one most often held by a faculty member serving as a resource for groups of students engaged in project work. Each student group has one or more supervisors for a project. Supervisor-group relationships do not extend beyond the duration of the project. That is, a student (or group of students) does not have a formal multi-term or multi-year relationship with one particular supervisor. In other educational contexts this type of role might be known as an advisor or facil-

itator.

Project Courses: Courses offered as part of a study program that relate directly to the term theme and the students project work. Students elect to take a project course on the basis of the course's relevance to the project work. In some educational contexts what is defined here as a course might be known as a subject.

Study Courses: Courses required as part of a study program that introduce students to fundamental concepts, theories or skills of a particular discipline. These courses are assessed (examined) separately from the project courses and project work. In some educational contexts what is defined here as a course might be known as a subject.

10.11.2 Principles

10.11.2.1 Educational Vision

The institution has an agreed-upon and clearly articulated vision for how problem and project based pedagogies are integrated into its institutional objectives. This educational vision informs the development of study programs and curricula, influences the faculty members and students who comprise the institution, and shapes the institution's relationships with key constituents.

01.1 The institution has developed and adopted a systematic frame work for the problem and project based approach to education. The systematic framework informs the development of degree requirements, courses and the pedagogical approaches of faculty members.

01.2 In implementing the Aalborg PBL Model, the institution demonstrates an ongoing commitment to its central principles: problem orientation, project organization, integration of theory and practice, participant direction, a team-based approach, collaboration and feedback:

A) Problem orientation: Problems/wonderings appropriate to the study program serve as the basis for the learning process.

B) Project organization: The project stands as both the means through which the students address the problem and the primary means by which students achieve the articulated educational objectives. The project is a multifaceted and often extended sequence of tasks culminating in a final work product.

C) Integration of theory and practice: The curriculum, instructional faculty members and project supervisors facilitate for students the process of connecting the specifics of project work to broader theoretical knowledge. Students are able to see how theories and empirical/ practical knowledge interrelate.

D) Participant direction: Students define the problem and make key decisions relevant to the successful completion of their project work.

E) Team-based approach: A majority of students' problem/ project work is conducted in groups of three or more students.

F) Collaboration and feedback: Students use peer and supervisor critique to improve their work; and the skills of collaboration, feedback and reflection are an important outcome of the PBL model.

01.3 The institution has developed and adopted learning objectives specific to the problem and project based approach. These objectives complement specific program objectives and address student competencies in problem formulation, self-reflection, meta-cognition, and collaboration.

01.4 Depending on the educational program and problem, students are encouraged to integrate knowledge from across the traditional disciplines in

the project work in order to analyze and solve the problem.

01.5 The institution has clearly articulated the scope of implementation of the problem and project based educational model. Though an institution-wide adoption of the educational model provides the greatest educational benefit, the problem and project based approach can be effectively implemented at the faculty or program level. Course-level implementation presents challenges that significantly truncate the educational benefits and is not sufficient to qualify as problem and project based learning.

01.6 Key groups within the university (trustees, faculty, students and administration) demonstrate ongoing support of the problem and project based approach.

01.7 Students understand the theoretical framework and practical benefits to the problem and project based model. Further, students are prepared to identify and articulate the strengths of the educational model vis-à-vis their academic and professional preparation.

01.8 The institution clearly presents the problem and project based model to key external constituents. Businesses, social agencies and governmental agencies with which the institution interacts are aware of the institution's educational model and support its implementation through partnership with the institution in identifying appropriate problems for students to address.

10.11.2.2 Curriculum

The problem and project based centered approach shapes the institution's program curricula, which provide for student orientation to the pedagogical method, explicitly link theory and practice, are appropriately adapted to disciplinary paradigms, and are anchored by clearly articulated educational objectives.

02.1 All programs include first-term credit-bearing academic work that introduces and orients students to the problem and project based educational model. This component of the curriculum addresses e.g. learning theory, problem definition, project management, conflict management, and approaches to collaborative work all within the context of the institution's problem and project based approach. Further, the orientation component provides students with highly-scaffolded project experiences to prepare them for later self-governed group work.

02.2 The program curriculum is mapped onto academic terms (e.g. semesters) according to an appropriate progression with regard to depth and breadth of content as well as sophistication of project work. This progression is specific to and shaped by the discipline or profession. Specific learning objectives are articulated for the program and associated with each term. These objectives include both overall educational objectives linked to

the problem and project based pedagogy and the specific objectives of the program.

02.3 Each program consists of an appropriate balance of orientation courses, study courses, and project-related courses which accompany the students' project work. Depending on the program, timespan and the overall objectives, the project might vary in size. In general, the students' project work comprises at least 50 percent of their academic credits and, when combined with project course credits, comprise approximately 75 percent of the students' total term credits.

02.4 An appropriate cluster of required study courses introduces students to the patterns of thought, theories, skills and fundamental knowledge of the discipline or profession.

02.5 In each term, a theme is selected to serve as the context in which project courses and projects address the learning objectives. Themes may be fixed due to an overall curriculum program or vary from term to term. The theme connects to the overall learning objectives and is articulated in a formal statement that is distributed to students and guides their problem formulation and project work. Within the theme and the overall learning objectives, problems and project proposals are to be chosen.

02.6 In each term, a number of project courses are offered, linked to the educational objectives and shaped by the term's theme. Students select project courses according to the courses' relevance to their term project work. (If semesters are governed by fixed themes, central theme related courses replace project courses). These project courses are sequenced within the term in order to facilitate timely support of students' project work (i.e. the majority of project course credits are offered in the early weeks of the term).

02.7 Supervisors ensure that students' problem formulations, through alignment with the term theme and overall objectives, provide a sufficient context for achieving the learning objectives. Further, problem formulations and project work align with the adopted curricular progression (i.e. depth of knowledge and sophistication). Students' problem formulations are allowed to evolve as the students progress in the project work.

02.8 The curriculum provides adequate means for students to establish connections between the specifics of the project courses and project work and the broader knowledge and skills of the discipline or profession. Students develop skills for management, synthesis, and construction of knowledge such that they are able to navigate, evaluate, integrate and apply knowledge not explicitly included in the curriculum. The learning involved in establishing these connections and skills are further facilitated by peer students, faculty members, supervisors and assessment activities.

02.9 The content of the curriculum is informed by the development/

evolution of knowledge within the discipline or profession and by the demands of practice as encountered through application in the project work.

02.10 To the extent possible, problems and subsequent project work are informed by the state of the art in the discipline or profession. This is facilitated by ongoing relationships between the university and external constituents such as businesses, social agencies and governmental agencies as well as awareness of disciplinary research developments.

02.11 The institution encourages students to collaborate with external businesses and organizations for example through work placements or internships that extend their learning further into the professional world.

10.11.2.3 Students

Students understand the problem and project based educational model and, through that understanding, are able to successfully engage it in order to achieve the institution's educational objectives. In their work, students maintain an institutional culture of authentic collaboration, self motivation, peer-learning and personal responsibility. The institution supports students in this regard through orientation and the provision of appropriate services.

03.1 Students are able to identify the ways in which the problem and project based approach shapes their academic work and successfully integrate its components as they achieve the broader institutional learning objectives as well as the objectives for their program. In their work, students demonstrate a high level of self-motivation and personal responsibility for learning.

03.2 Students possess, and are supported in developing, strong project management skills that enable the timely and successful completion of projects.

03.3 With appropriate support from the institution, students are able to negotiate and successfully address the inevitable conflicts that arise in collaborative work. These abilities are developed as part of students orientation to the problem and project based model and are subsequently supported, as appropriate, by faculty members and administrators. Clearly stated institutional policies identify the scope and nature of supports available to students.

03.4 Students contribute to and maintain a strong culture of collaboration, which values active participation in course and project work. Strategies for successful collaboration on project work are presented to students as part of their orientation experiences (i.e., early courses and projects). In their project groups, students formally or informally address expectations regarding academic performance, work patterns, and norms for interpersonal relations. Students show a high level of support for one another in their academic work.

03.5 Students play a meaningful role in the administration of degree programs. Channels are provided for student input into curricular development and implementation, term themes, course offerings, and academic policy, e.g. through study board participation or systematic evaluations.

03.6 Students actively participate in institutional assessment and evaluation processes. Participation is characterized by a clear commitment to improvement, critical analysis and constructive feedback.

03.7 Students actively engage in substantive dialog with faculty members regarding their course work and the application of knowledge within the context of their problem/project. This dialogue takes place in a collegial atmosphere that is characterized by mutual respect and the authentic engagement of all involved.

10.11.2.4 Faculty

Faculty members understand and are committed to the problem and project based educational model. The institution ensures that faculty members are appropriately introduced to and understand the model's theoretical framework and are able to handle the best practices by which it is implemented in the curricula and pedagogically. As supervisors, faculty members are directly involved in the project-related work of the students. Faculty members hold primary responsibility for continuously adapting and developing the model to the institution's particular educational and disciplinary context, ensuring integrity of implementation, and guiding its development.

04.1 All faculty members have been introduced, through appropriate means (e.g. orientation, staff development activities, training, mentoring, observation, etc.), to the theoretical framework behind problem and project based learning and best practices in its implementation. Introductory programs address both the broader educational goals of the model as well as the specifics of its implementation in the relevant discipline or profession.

04.2 Faculty members understand and are able to incorporate best practices in supervising and advising student project groups. They are aware of appropriate levels of direction in the process of advising groups (i.e. not directing student work, yet facilitating students progress). Faculty members are willing to assist student project groups in managing challenges due to the group work process, for instance problems with the collaborative process, intra-group conflict, project management, etc.

04.3 The institution has articulated, in consultation with faculty members, policies guiding workload as related to instruction, supervision and administration using the problem and project based model. Specifically, the institution has established guidelines for the maximum number of groups

one faculty member is able to effectively serve as the primary supervisor for in one term.

04.4 Through their engagement in administrative structures (e.g. committees, study boards, etc.) faculty members are directly involved in the development and maintenance of program curricula as well as their ongoing assessment. Faculty members play the central role in developing term themes which guide students' problem formulations and project work as well as in the organization of term project courses and supplemental academic activities.

04.5 Members of the faculty actively pursue and maintain relationship with external constituents (i.e. others in the academic and professional communities) in order to ensure curricular relevance and to strengthen relationships between the institution and the context within which it operates.

10.11.2.5 Assessment of Students

The institution is committed to assessing and evaluating both student performance and program effectiveness. Policies and structures are in place to effectively assess individual student performance within the context of the group project work. A parallel set of policies and structures guide the assessment of students' performance in individual academic work (e.g. study courses). Program effectiveness is subject to formative and summative assessment and evaluation processes that involve faculty members, students and administrators as appropriate. There are clearly demonstrated links between program assessment and efforts to improve existing programs and develop new programs.

05.1 Assessment of students' group project work is conducted in a group setting and stands as the main assessment method. All group members are present for an extended examination involving the group's advisor, additional faculty members from the institution, and faculty members from other universities.

05.2 Examiners guiding the group assessment process pay careful attention to exploring not only the quality of the project work itself, but also to determining the extent to which, through the project work, students have achieved the broader learning objectives and have developed an understanding of the larger theories, concepts and issues as they transfer to different applications.

05.3 Students' project-related course work (i.e. project courses) is assessed within the context of the project work itself. The problem as formulated by the students and the subsequent project work are used by examiners as a lens for determining those aspects of the project courses that are relevant to assess. Forms of both formative (status seminars, peer evaluation, super-

visor feedback, etc.) and summative assessment (portfolio assessment, etc.) may be implemented. The greater portion of assessment activity is dedicated to formative assessments, which are designed to develop students' abilities to provide feedback to others and assess their own progress. Alignment as well as validity and reliability are to a great extent important goals.

05.4 Students academic work (e.g. study courses) is assessed according to clearly documented policies and procedures and learning objectives.

05.5 Though conducted in a group setting, students receive appropriately differentiated individual grades for their contribution to the project work and their mastery of the stated learning objectives.

05.6 The institution engages students, faculty members and administrators in the assessment and evaluation of study programs. These activities take on a variety of forms (e.g. student course evaluations, group feedback sessions), and are conducted during and at the end of each term.

05.7 The institution can document the incorporation of study program assessment data in the decision making processes related to administration and improvement of existing study programs as well as the development of new study programs and procedures in relation to the context of the problem and project based model.

10.11.2.6 Resources

The institution acquires and deploys resources in ways that consistently support the problem and project based educational approach. In particular, adequate physical space for student project groups is provided. Library and technological resources provide current and comprehensive access to information and systems that enable students to achieve the institution's educational objectives.

06.1 Each project group is provided with work space for the duration of the academic term. This space may be individual rooms for each group or larger rooms divided into individual work areas for each group. Physical space may be supplemented by virtual space.

06.2 Classroom and laboratory space are provided as required by study courses and project courses.

06.3 As appropriate, materials required for completion of project work are provided for groups. A process exists for students to request institutional funding for higher cost supplies or other non-material project-related expenses (e.g. travel). Funds for such expenses are distributed and managed within each program.

06.4 The institution's library maintains subscription to key disciplinary and professional journals (preferably through online database subscriptions) in order to provide students with sufficient access to current research publi-

cations. Further, the acquisitions for and maintenance of physical collections (i.e. books and hard-copy journals) are guided by identified fundamentals within each discipline and profession (i.e. less time-sensitive material).

06.5 The institution maintains an appropriate array of operational and modern technological resources (i.e. computers, research equipment and software) necessary for students' course and project work. Central to these offerings are resources which facilitate the collaborative work of project groups.

10.11.2.7 Program Administration

07 The institution has adopted an organizational configuration and established administrative structures that facilitate the effective implementation of the problem and project based educational approach.

07.1 The administration of each program is conducted primarily by faculty members and support staff in a largely decentralized manner. Administrative decisions, including term themes, the administration of groups, and course offerings incorporate the input of faculty members and students within each program. Within each program, an appointed term coordinator (often a faculty member) gives oversight to the administration of program details for that term.

07.2 The institution facilitates inter-program and inter-faculty (school) collaboration on project work.

10.11.2.8 External Relations

The institution maintains active relationships with key external organizations that support the effective implementation of the problem and project based model. Administrative support is provided to faculty members and students to facilitate and manage their connections with external contacts such as businesses, social agencies, governmental agencies, foundations, and other academic institutions. These external contacts stand as a source for student problem formulations and project work, and the institution's research and project work benefit from these external organizations.

08.1 The institution has administrative structures to facilitate the connections between faculty members, students and external organizations for the purposes of formulating authentic problems and providing authentic contexts for project work. Clearly articulated policies guide project work involving external organizations and ensure that such projects give first priority to the institution's educational objectives.

08.2 The institution has policies and structures to support faculty members and students in negotiating issues of intellectual property rights and confidentiality as they surface in project work.

08.3 Connections with external organizations are leveraged by the institution to provide internship and work placements for students and graduates.

08.4 Connections with external organizations provide the necessary experts who participate in the institution's assessment processes as external examiners of problem solutions.

08.5 The institution's academic programs, project work and research are responsive to the broader context in which the institution operates. Connections with external agencies provide feedback for program maintenance and development, and the institution can demonstrate ways in which this feedback informs decision-making.

08.6 Businesses and organizations with which the institution collaborates are able to articulate a clear understanding of the problem and project based pedagogical approach. Further, these institutions understand the ways in which this model is beneficial to the preparation of its graduates and to the organizations themselves.

10.11.2.9 Educational Research

The institution conducts ongoing educational research into the implementation, adaptation and outcomes of the problem and project based educational model. Linked closely to assessment efforts, this expanding body of research is a means of documenting and disseminating local adaptations and innovations.

09.1 The institution systematically gathers data in order to:

- A) Document the PBL model for both internal and external purposes
- B) Develop an internal system for improving the model
- C) Document current and emerging local practices
- D) Relate contextualized educational practice to theory
- E) Relate data and research findings to other international studies

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