FOSTERING ENTREPRENEURSHIP AT UNIVERSITIES

LESSONS FROM MIT, IIIT, AND UTRECHT UNIVERSITY

Master Thesis

Final Version (17 September 2012)

T. Jacobus meergenaamd van de Zande

Fostering Entrepreneurship at Universities

Lessons from MIT, IIIT, and Utrecht University

Author:

T. Jacobus meergenaamd van de Zande
Student number: 3231992
t.jacobusmeergenaamdvandezande@uu.nl

Master Business Informatics
Thesis period: 01-12-2011 – 20-09-2012

Supervisors:

Prof. dr. S. Brinkkemper
Organisation & Information
Dept. of Information & Computing Sciences
Utrecht University

dr. S. Jansen
Organisation & Information
Dept. of Information & Computing Sciences
Utrecht University

Prof. dr. E. Stam
Entrepreneurship & Innovation
Utrecht School of Economics
Utrecht University

Universiteit Utrecht

ABSTRACT

Universities all across the world are increasingly trying to become more entrepreneurial, in order to stay competitive, generate new sources of income through licensing or contract research, and follow policy guidelines from governments. One of the entrepreneurial activities is the fostering of entrepreneurship among students through entrepreneurship education and incubator services. However, there is no established theory on how to foster entrepreneurship effectively. It is currently not known what offerings should be offered, and how individual offerings contribute to startup success. Through multiple case studies the entrepreneurial offerings at MIT in the United States, IIIT in India, and Utrecht University in the Netherlands are investigated. Additionally, several interviews with entrepreneurs that graduated from these institutes have been performed. This led to important insights in how entrepreneurial offerings contributed to startup success. Several successful examples of entrepreneurial offerings are presented, and a model is proposed that categorizes and visualizes the types of activities that university offerings should support.

ACKNOWLEDGEMENTS

When you are reading this, it probably means I finished my thesis, and successfully completed my Master degree in Business Informatics. I would like to take this opportunity to tell you a bit about the months spent writing this thesis, and, most importantly, extend my gratitude towards some of the individuals that made it possible for me to successfully complete this thesis project.

This thesis project was not exactly ordinary. During the last ten months, I travelled over 13.000 kilometers, typed more than 100.000 words, visited two continents, met many interesting people, experienced unfamiliar cultures, and most importantly, had a great time doing it. I interviewed 28 inspiring individuals that were passionate about entrepreneurship. Through their interesting stories and enthusiasm, these people helped me to stay motivated, and prevented me from becoming discouraged by the amount of work of this project.

The successful completion of this master thesis would not have been possible without the support, guidance, inspiration, and motivation of a large group of individuals. Some of which deserve a special appreciation:

First of all, I would like to express my gratitude to my supervisor, Sjaak Brinkkemper, for challenging me to take on this daunting, but rewarding research project, and for arranging the financial support to enable this project. In addition, I would like to thank him for always making the time to read my drafts and provide insightful feedback regardless of the extremely hectic and stressful period of the last months. I also would like to thank my second supervisor, Slinger Jansen, for his flexible attitude and excellent feedback at a very short notice. More importantly, I would like to thank him for hosting me at MIT, and for his invaluable support during that time. I would also like to express my gratitude towards Jaap Kabbedijk for the great time in Boston, and for letting me stay in his apartment during my visit to MIT. I would like to thank Vasudeva Varma for hosting me at IIIT, and for the great care and support during my visit there. I would also like to thank Erik Stam for his time, support, and expertise on entrepreneurship. Additionally, I am grateful towards everyone who has participated in this research, by making time for an interview or by responding to the survey.

I would also like to thank my friends and family for their feedback, support, and most importantly, the much needed distraction. I would like to thank my parents for their encouragement, and never-ending support that enabled me to complete this research project. Finally, I would like to thank my girlfriend, Lisa, for her love, sympathy, and patience during the times I was abroad and during the last hectic weeks.

MANAGEMENT SUMMARY

This research provides insights in how to foster entrepreneurship at universities by comparing the offerings related to entrepreneurship at three different universities. Fostering entrepreneurship has become important for universities all over the world, as entrepreneurship has a high impact on the regional economy. Currently there is no consensus on how to foster entrepreneurship on a university level. It is clear that universities can have an influence on startup success, if we consider examples such as Stanford and MIT. However, it is unclear *why* one university succeeds in creating a fertile entrepreneurial climate while others, with similar initiatives, fail. Which initiatives have proven successful during new venture formation? Moreover, to what extent did they contribute to startup success? This research uncovers success patterns in fostering entrepreneurship by comparing entrepreneurship stimulating initiatives, and the start-ups that emerged from them, at top universities in three separate regions of the world.

Through several case studies, entrepreneurial offerings are identified and compared at MIT in the US, IIIT-H in India, and Utrecht University in the Netherlands. These entrepreneurial offerings are evaluated during interviews with entrepreneurs that graduated from the universities, in order to find out how they contribute to startup success. Even though these universities are completely different in terms of size, geographic location, and academic focus, they share a clear focus on entrepreneurship.

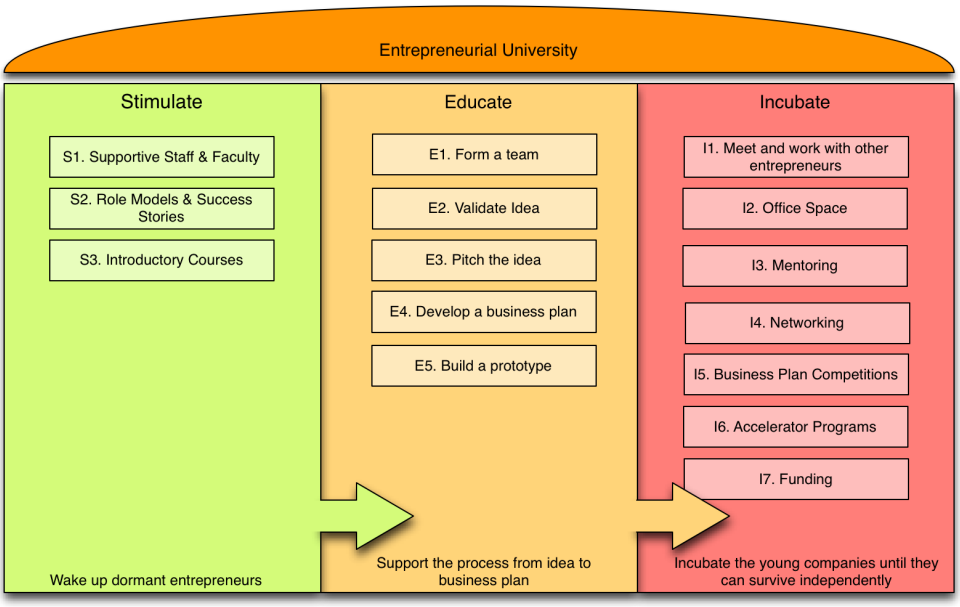

Figure 1: The three-stage fostering entrepreneurship model

Comparing the evaluations of offerings at the three institutes provides insights in what kind of activities should be supported in order to effectively foster entrepreneurship. A model (Figure 1) is proposed that divides these activities in three stages: a stimulation stage, during which the activities should focus on making students aware of entrepreneurship; an education phase, in which student learn what it takes to be an entrepreneur and run a company. This stage should focus on providing an authentic entrepreneurship experience, through courses in which students form a team and create and execute a business plan. Finally, the incubation stage contains activities that directly support startups, such as office space, mentoring and networking services. Overall, this research

finds that university offerings do contribute to startup success. Different offerings contribute in different ways. This research provides insight in how individual offerings contribute to the successful fostering of entrepreneurship.

Based on the findings of this research, several recommendations to improve the quality of the entrepreneurship fostering initiatives at Utrecht University are made. The recommendations are:

- Increase marketing efforts regarding entrepreneurship offerings, and add offerings that target the stimulation stage
- Offer accessible incubator offerings for interested students, such as co-working spaces dedicated for student-entrepreneurs
- Increase Master-level education offerings, so that Master students are introduced
- Increase the number of authentic-learning based entrepreneurship courses, and improve the team-forming phase.
- Create an alumni network to improve relations with entrepreneurial alumni, as they serve as important role models to inspire new entrepreneurs.

These recommendations promise to improve the effectiveness of entrepreneurial offerings, and ultimately contribute to an increase in the number of successful startups that emerge from Utrecht University.

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1. INTRODUCTION

> *"We know that some universities play an important role in many economies through their core education, research and development, and other spillovers. However, in order to support economic growth through entrepreneurship, universities must create a culture and programs that make entrepreneurship widely accessible to students"* (Roberts & Eesley, 2011)

Entrepreneurship has become one of the most important drivers of the global economy, as it creates new jobs and it sparks innovation (Acs & Audretsch, 2010; Laukkanen, 2000; Lazear, 2002). While Fortune 500 companies have lost more than 5 million jobs since 1980, new ventures created 34 million new jobs in that same period (Kuratko, 2003). In the last three decades, policymakers worldwide started to realize the importance of stimulating entrepreneurship within the regional economy, pushing it high on their agendas, because of the aforementioned benefits (Menzies & Paradi, 2003).

It is understood that universities play an important role in the regional entrepreneurial climate. As institutes focused on creating new inventions and knowledge, they serve as an important input for knowledge and innovation exploited by new ventures (Edmondson & McManus, 2007; Shane, 2004). Etzkowitz (2001) calls it the second academic revolution; the first academic revolution added research as a second mandate next to the mandate of educating students, now entrepreneurship has become a third mandate of universities.

University entrepreneurship, or academic entrepreneurship, has therefore become a high priority for policymakers from inside the universities as well as local governments in virtually all developed countries (OECD, 2008). Due to their close link with industry and focus on entrepreneurship, Stanford and MIT were once seen as anomalies within the academic system. Now they have become the model for other universities to emulate (Etzkowitz, Webster, Gebhardt, & Terra, 2000). Universities and regional governments in all regions of the world try to create highly innovative science parks where young entrepreneurs lead innovation and, ultimately, economic growth.

A university has several initiatives at its disposal in order to stimulate and facilitate innovative entrepreneurship. Among such initiatives are: education in entrepreneurship, hosting business plan competitions, setting up technology incubators and technology transfer offices, and appointing chairs for entrepreneurship (Lüthje, 2002). Universities worldwide employ a combination of these initiatives in order to create an attractive entrepreneurial climate. However, the result is not always as successful.

1.1. PROBLEM STATEMENT

Currently there is no consensus on how to foster entrepreneurship on a university level. It is clear that universities can have an influence on startup success, if we consider examples such as Stanford and MIT. However, it is unclear *why* one university succeeds in creating a fertile entrepreneurial climate while others, with similar initiatives, fail. Which initiatives have proven successful during new venture formation? Moreover, to what extent did they contribute to startup success? This research tries to uncover success patterns in fostering entrepreneurship by comparing entrepreneurship stimulating initiatives, and the start-ups that emerged from them, at top universities in three separate regions of the world.

This research specifically focuses on the stimulation of software entrepreneurship, as opposed to entrepreneurship in general. Next to the author's background in Information Technology, there are several other reasons to study this particular sector, such as the growth of the software industry and the low capital requirements, which will be explained further in the related literature section.

1.2. RESEARCH QUESTION

The problem statement resulted in the following research question:

How can universities foster software entrepreneurship among students?

In order to provide an answer to this question, several sub-questions need to be answered. The sub-question on which the research approach is designed are formulated as follows:

1. *What methods do universities have to foster entrepreneurship among students?*
   - *1.1. What facilities are provided at universities?*
   - *1.2. How effective are facilities offered by the universities?*
   - *1.3. How do they contribute to start-up success?*

2. *Is there a difference in students' attitude towards entrepreneurship at the different universities? And how do these differences relate to the offerings provided by the universities?*

1.3. SCOPE

The scope of this research project is limited exclusively to university initiatives. There are numerous factors that influence an entrepreneurial climate. The initiatives of a university are not the only factors that determine the success of fostering entrepreneurship. Support of neighboring companies, venture capitalists, commercial incubators, and government initiatives can all have additional positive effects. However, it is interesting to look at the contribution of universities, as they specifically deal with innovation-based entrepreneurship, by combining science and technology with highly educated students and entrepreneurs. Therefore, this research focuses solely on entrepreneurship-related initiatives at universities.

1.4. RELEVANCE

Policymakers at universities all around the world are trying to promote an entrepreneurial spirit at their institutes. This research will benefit those policymakers by providing insights in how entrepreneurship is fostered at three top universities, as well as provide scientific evidence on how the different initiatives at those universities contribute to startup success.

1.4.1. Scientific Contribution

Yusof & Jain (2010) performed an extensive literature review on research in university entrepreneurship. The findings of this research will be presented in chapter 3. The research identified several future research directions. One of the issues they highlighted was that most studies focus on university entrepreneurship in the USA or selected European countries, and that only a few studies compare and contrast university entrepreneurial activities across countries. They call for further comparative research between different universities, especially in other parts of the world, in other cultures and with other economic contexts, in order to examine whether the same patterns exist and the same dynamics apply. This research will address precisely that topic, since it compares three top universities in three different regions of the world. Next to the USA and Europe, this research will also investigate a top university in India. To the time of writing, such research has not yet been published.

More generally, the results of this research project add to the body of knowledge in the field of entrepreneurial science, in the form of new insights in the conception and initial startup phase of software ventures and how these relate to entrepreneurship stimulating initiatives. It also provides insights in regional differences of (intentions on) software entrepreneurship.

1.4.2. Societal Contribution

Societal contributions of this research include that the results provide new insights in the organization of software entrepreneurship education and the incubation of software ventures. Next to that, the results from this research could increase the effectiveness of software entrepreneurship stimulation, resulting in an increase in regional economic growth. Ultimately, universities can use the results of this research to assess their entrepreneurship stimulating activities, and benchmark themselves against the three universities considered in this research. This helps them to better assess their current entrepreneurial offerings and in developing new entrepreneurship related initiatives at the institute.

1.5. EXPLANATION OF CONCEPTS & DEFINITIONS

In this thesis, several concepts are used that either have multiple and/or unclear definitions. For example, as will be discussed in chapter 0, the concept of entrepreneurship has many definitions, each with slight differences, and therefore slightly different meaning. Therefore the most important definitions maintained in this thesis are explained below.

- **Entrepreneurship:** There are several definitions that try to explain the concept of entrepreneurship. In this research, we consider one of the most accepted definitions: "*the act of entrepreneurship is the act of creating a new combination of (1) the*

introduction of a new good, or a new quality of a good, (2) the introduction of a new method of production, (3) the opening of a new market, (4) the conquest of a new source of supply of raw materials or components, or (5) the reorganization of any industry." (Schumpeter, 1936). Section 3.1 explains why this definition has been chosen.

- **University Entrepreneurship: The concept of university entrepreneurship** encompasses activities within universities related to entrepreneurship and the commercialization of knowledge: patenting and licensing knowledge, creating incubators, science parks, and university spin-offs, and investing equity in start-ups (Rothaermel, Agung, & Jiang, 2007).

- **Academic entrepreneurship:** A concept related to university entrepreneurship, academic entrepreneurship considers the entrepreneurial activity of academics. It "*involves the variety of ways in which academics go beyond the production of potentially useful knowledge and take some sort of leadership role in ensuring successful commercialization of university research and technology*" (Henrekson & Rosenberg, 2001). Academic entrepreneurship considers all initiatives that could be described as entrepreneurial. This also includes for example external teaching, contract research, and consulting.

- **Innovation-based entrepreneurship:** focuses on the creation of innovation-based enterprises. Such enterprises have a clear competitive advantage and high growth potential, often pursuing global opportunities (Aulet & Murray, 2012; Manimala, 1996; Stam, Suddle, Hessels, & Stel, 2009). These firms perform the type of entrepreneurship that is associated with a high contribution to regional economic growth (Birch, 1979). There are several synonyms, such as: ambitious entrepreneurship and high-impact entrepreneurship.

- **Fostering Entrepreneurship:** The Oxford Dictionary defines the act of 'fostering' as: "*to encourage or promote the development of (something, typically something regarded as good)".* Therefore, fostering entrepreneurship considers the encouragement and promotion of (the development of) entrepreneurship. This includes both:
    - The stimulation of entrepreneurship, which concerns activities that encourage entrepreneurship, and persuade people to consider pursuing entrepreneurial careers.
    - The nurturing of entrepreneurs, which concerns the activities and facilities that support the growth and development of entrepreneurs and their startups.

- **University Offerings / Entrepreneurial Offerings**: Throughout this document, these terms are used in synonym. They refer to all activities, facilities, programs, courses, and other initiatives undertaken by a university or its subsidiaries to foster entrepreneurship.

- **Dormant Entrepreneurs:** Individuals that do have an intrinsic propensity towards entrepreneurship, and possess certain skills often associated with entrepreneurship, such as a tendency to risk taking, but have not yet explicitly considered starting a business.

1.6. THESIS OVERVIEW

The rest of this thesis is organized as follows. Chapter 0 describes the research approach. Chapter 0 provides a thorough review of the current literature on entrepreneurship in general, and more specifically important concepts in the domain of university entrepreneurship. The three case studies, that have been conducted at a university in the USA, Europe and India, are respectively described in chapters 0, 5, and 0. In chapter 0 the case studies are analyzed, and based on this analysis the research questions are answered. Chapter 0 presents several important recommendations for Utrecht University, and discusses the research limitations. In chapter 0, the research is concluded by summarizing the findings and answering the research questions. Additional, several further research challenges are presented.

2. RESEARCH APPROACH

The research field of university entrepreneurship is "*at the embryonic stage of development*" (Yusof & Jain, 2010). Especially the focus of this present study, the fostering of entrepreneurship among students, has received little attention. As the literature study will show, existing studies in this field up until now focused on the effects of *one* single course or *one* incubator. There is no accepted theory on *how* to foster (software) entrepreneurship at universities. Therefore, this study will focus on the development of nascent theory. Exploratory qualitative research methods, such as interviews and case studies and an inductive and iterative data analysis are the most suitable research methodologies for such nascent theory studies (Edmondson & McManus, 2007).

In order to provide a complete answer to all the research questions, a combination of both qualitative as well as quantitative research methods are required. Therefore, a mixed method research approach is employed. A mixed method research strategy combines qualitative and quantitative methods in a way that the qualitative data is either corroborated, elaborated, complimented or contradicted by the quantitative data (Brannen, 2005). The suitable research methods for this research project are a multiple-case study research, consisting of interviews, document study and data analysis, and survey research. Both of these methods are described in detail in their respective subsections.

The multiple-case study research method is the most suitable research method for the qualitative part of this research project, as it provides a way to gain in-depth insight in an unstructured and unfamiliar environment. It provides a way to inductively identify new concepts and, ultimately, create new theory. The goal of the case study research is to clarify what entrepreneurship stimulating offerings are present at each university, how these offerings function and how entrepreneurs experienced these offerings. These results are then used to compare entrepreneurship stimulation at the three institutes of interest, and finally to provide the general success-patterns in stimulating entrepreneurship.

For the quantitative data gathering, survey research is used, as it is the most efficient way to gather data from a large set of responses. A survey is conducted among Computer Science / Information Science students at all three case universities. The survey focuses on entrepreneurial intentions of these students. Additionally, the survey asks these students how they experienced the different university offerings. This data corroborates the more detailed interview-data that considers the same issue.

2.1. RESEARCH APPROACH

The research approach, as depicted in is visualized using the modeling method as proposed by Verschuren & Doorewaard (2007). The rectangles represent 'research objects'. Vertical arrows represent 'confrontations' between the research objects, which then result in a new research objects. In the end these research objects result in the final deliverable.

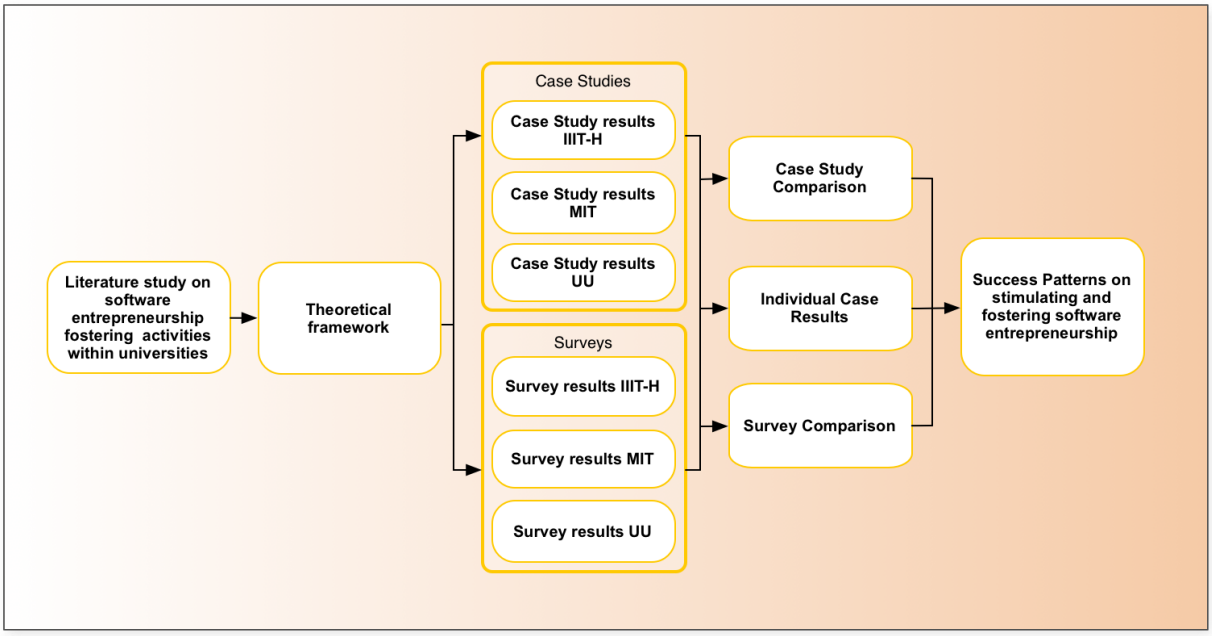

Figure 2: Research Approach

First of all, a literature study will be conducted in order to develop a theoretical framework on the fostering of entrepreneurship at universities. The knowledge contained in this theoretical framework will serve as input to develop the case study protocol and design the survey. Then the case studies will be conducted consecutively at IIIT-H in India, MIT in the USA and Utrecht University in the Netherlands. At the same time the survey research will be conducted. The case studies result in general regional results. Afterwards, these results are analyzed and the cases as well as the survey results are compared, in order to provide an answer to the research questions. In the following section, each step in the research approach is described in detail.

2.2. LITERATURE STUDY

In order to develop an initial theoretical framework to support the case study research, a literature study is first conducted. This literature study focuses on three main themes that relate to the stimulation of entrepreneurship within universities: entrepreneurship in general, university entrepreneurship, and entrepreneurship education. The literature study compares and contrasts the state of the art of research within these themes.

Research papers are gathered using keyword search in Google Scholar. Initially, the following key words were used: “entrepreneurship”, “university entrepreneurship”, “academic entrepreneurship”, “stimulating entrepreneurship”, “fostering entrepreneurship” and “entrepreneurship education”. Papers were selected based on relevance, by reading the title and abstract. This resulted in 140 relevant papers. In addition, forward and backward reference search on those 140 papers resulted in 90 additional relevant papers. The literature study was considered complete as soon as no new concepts related to the previously mentioned themes can be discovered. An overview of the different concepts and research streams in university entrepreneurship is presented in chapter 3.

2.3. CASE STUDY RESEARCH

A case study research, as described in Yin (2009), is the preferred method when "how" or "why" questions are being posed. As concluded in the related literature section, there is practically no previous research, and therefore no existing theory, in this particular direction. Case studies at three universities with an active, but differing, entrepreneurial climate could provide important insights in how and to what extent different factors affect entrepreneurial success.

One part of the case studies mostly consists of a documentation study, in order to determine the facilities that are offered at the different universities. Published papers discussing or comparing case studies on entrepreneurship stimulating initiatives, as well as university websites and course descriptions, will be reviewed in order to determine what facilities are offered at the case universities. To further investigate the entrepreneurial offerings identified in the document study, several unstructured interviews with relevant faculty members will be conducted.

In addition, several in-depth semi-structured interviews will be performed at local start-ups that emerged from the university (6-9 interviews with founders per university). These interviews provide insights to how the facilities, as offered by the universities, contributed to the success of local start-ups that originated at that university. What offerings did start-ups actually use? And what were their experiences? Overall, the case studies provide insights in the role of the university in the success of a start-up, and therefore answer research question 1.

In order to ensure a similar and unbiased approach during the three case studies, a case study protocol is developed. The case study describes why, how and with whom the case study interviews will be performed and how the results are interpreted. The case study protocol can be found in the appendix.

2.3.1. Case Selection

The case studies will be performed at three universities divided over three regions. These particular universities have been selected as they are considered key cases in relation to the concept of university entrepreneurship, with a focus on software entrepreneurship. For India, the case study will be conducted at the International Institute of Information Technology in Hyderabad (IIIT-H). IIIT-H is one of the prominent Indian IT education and research centers. For Europe, the case study will be performed at Utrecht University. Utrecht University, although existing for over 375 years, only recently started actively promoting entrepreneurship through a wide array of initiatives. In the USA the case study will be performed at the Massachusetts Institute of Technology (MIT). MIT is especially focused on information technology and already has a thriving entrepreneurial climate around the campus. It is seen as one of the most important examples of an entrepreneurial university (Franke & Lüthje, 2004).

Table 1: Overview of the three selected cases

Name	Location	Founded in	# Students	# Faculty	Ranking (ARWU'12)
Massachusetts Institute of Technology (MIT)	Cambridge, MA, USA	1886	10.894	1.018	3
International Institute of Information Technology (IIIT-H)	Hyderabad, AP, India	1998	1220	47	>500
Utrecht University (UU)	Utrecht, The Netherlands	1636	29.082	8.614 (Inc. staff)	53

2.3.2. Document Study

For each case university, the study starts with a thorough document study. The goal of the document study is to discover what the case university is offering in terms of entrepreneurship stimulating initiatives. These initiatives could range from courses, incubators, business plan competitions, etc. The types of documents that will be studied are:

- Course description/outlines
- University websites
- Publications on entrepreneurship stimulating activities:
    - Case-studies on specific initiatives
    - Status reports on specific initiatives
    - University wide publications concerning all entrepreneurship stimulating activities

Based on the findings from these documents, an initial list of offerings will be created. This list will serve as input during the faculty interviews. Based on the faculty interviews, the list will be adapted and extended, to serve as input for the founder interviews.

2.3.3. Interviews

The results of the document study will serve as input for a set of interviews. First, several key figures related to entrepreneurship at the specific institute will be interviewed. Secondly, 6-9 founders who have attended the university will be interviewed. These interviews will focus on their experience with the several university offerings.

University Faculty & Staff Interviews

The faculty and staff interviews extend the data of the document study. Participants are selected based on the results of document study, e.g. if the case university has an incubator, people responsible for the incubation center will be interviewed to gain additional data regarding the conception, mission and organization of the center. If the case university provides certain courses related to entrepreneurship, the teachers of these courses will be interviewed, et cetera. The faculty interviews will be unstructured, as the purpose of these interviews is to explore why the university

offerings exist and how the university offerings are organized. The faculty interviews will be transcribed and the transcripts are added to the case study database.

Company-Founder Interviews

To answer questions relating to the effectiveness of the entrepreneurship stimulating initiatives, several interviews at local startups will be performed. These semi-structured interviews will consist of predetermined questions, which are presented in the case study protocol (see appendix). The choice for semi-structured interviews as opposed to fully structured interviews is that semi-structured interviews leave room for additional questions and input from the interviewee. For example, in case the document study appears to be incomplete and that the interviewee presents unknown university initiatives.

The types of start-up companies that are eligible to be interviewed are companies that have been founded by university alumni or current university students, with a venture that is active in the software industry (specifically: companies that provide a software product or software services). These companies do not necessarily have to be founded during or after the founder(s) attended the university. Companies founded before the founder started attending the university could also be influenced by entrepreneurship offerings from the university. The eligible founders of start-up companies will be approached using contacts from the respective university, or alternatively using contact details as found on company websites.

The types of people that will be interviewed at the start-up companies are the founder(s) of the companies. They have witnessed firsthand how their company grew from an idea into a product or service, and can provide input on how university offerings influenced their ideas, decisions, strategy, and roadmap. The interviews focus on three themes: the company, the founder and his team, and the university offerings. The company questions are intended to gather some general data regarding the company, and to put the interviewee at ease by letting him talk about an easy subject. The questions relating to the founder and his team ask about the interviewee's history and experience with entrepreneurship, and also focus on how the founding team got formed. The interview questions are included in the case study protocol, which is presented in the appendix (chapter -).

2.3.4. Analysis

The case study database consists of documents from the document study and transcribed interviews from the interviews with university faculty and founders of startups This database will be analyzed using qualitative data analysis based on grounded theory principles (Charmaz, 2006). There has not been any previous research on the specific subject of *how* universities can stimulate entrepreneurship, and therefore no established theory exists. The grounded theory approach is particularly suited to inductively derive new theory from raw-data. This is an alternative to deductive methods that try to test existing hypotheses with data.

First of all, all interview recordings are transcribed. These transcriptions are then loaded into Nvivo, a software package suited for qualitative data analysis. Using Nvivo, the data is *coded* line by line. Data Coding, in the context of grounded theory research, means adding a label to each bit of data, linking the data to a concept. Basically, it provides an answer to the question "what is being talked about here". Afterwards, these concepts are either combined or linked together and main concepts are

identified. Grounded Theory Analysis describes multiple rounds of coding and data gathering. However, the nature of this research requires a relatively superficial data analysis: it concerns university offerings, which are concepts that are known beforehand. The data coding links statements by the founders to these offerings. Therefore only one round of coding is sufficient. Coding each statement to an individual university offering enables thorough analyses. Per university offering, a list is generated combining each individual statement regarding that offering. This way it is easy to capture the overall evaluation of the offering, as well as possible disagreeing statements.

2.4. SURVEY RESEARCH

The survey research aims to identify regional differences in entrepreneurial attitude among students by comparing quantitative data. The survey will be held among a sample of Computer Science and Information Science (CS/IS) students from each of the respective universities. The initial goal is to collect around 100 respondents per university. The survey results are expected to corroborate the case study results, by measuring how students evaluate the effectiveness of the facilities offered by their university. Additionally, the survey tries to provide insights in student's ambitions in entrepreneurship over different regions.

The survey is designed around three separate topics: personal background, university offerings, and career expectations/entrepreneurial intention. The personal background questions will ask questions relating to their study background, study level, age, and how many years they have been studying, in order to test whether there is a difference between certain subgroups in the population of CS/IS students. The university offerings questions will deal with entrepreneurship related offerings. Several of those offerings are presented and respondents are asked whether their university offers them, if they attended them and how they rate them. The career expectations/entrepreneurial intention questions will ask respondents if they already know what career they want to pursue, if their choice of university was influenced by what they wanted to become and how likely it is that the respondent will become an entrepreneur one day.

The survey will be conducted over the Internet. As the population consists purely of computer science and information science students currently enrolled at one of the universities, it can be assumed that each subject has access to the survey and is able to fill it. The survey will be created using the open source tool 'LimeSurvey', and will be hosted on a dedicated webserver.

The survey questions are based on an existing survey: the Global University Entrepreneurial Spirit Students' Survey (GUESSS). The GUESSS is an international research project on entrepreneurship and career expectations of university students. Its purpose is to grasp the entrepreneurial intent and activity of students using a geographical and temporal comparison. The GUESSS project is an initiative of the Swiss Institute for Small Business and Entrepreneurship at the University of St. Gallen. The international survey has been conducted every two years since 2003. The most recent survey dates from 2011. Universities from 26 countries across the world participated, generating 93.265 responses (Sieger, Fueglistaller, & Zellweger, 2011). The GUESSS project is based on a theoretical framework, which is depicted in Figure 3.

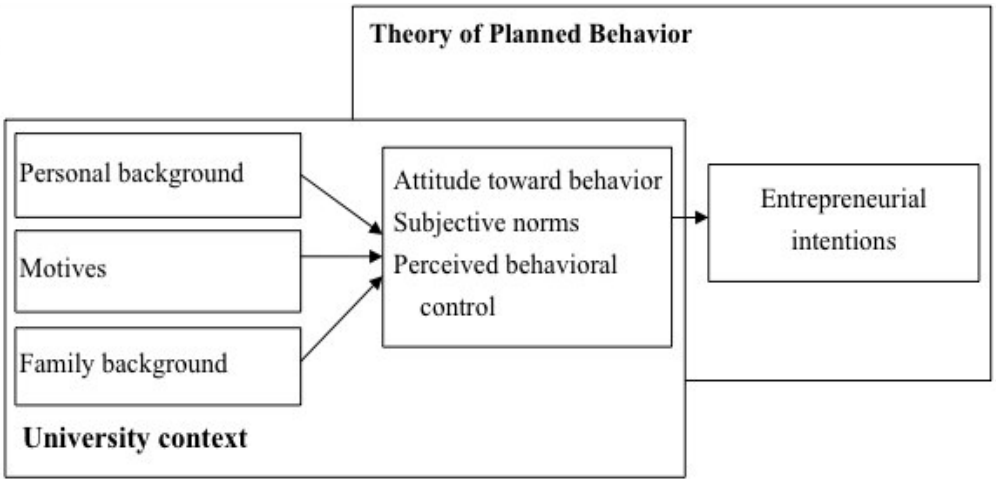

Figure 3: Theoretical Framework of GUESSS project (Sieger et al., 2011)

The foundation of this framework is the Theory of Planned Behavior (Ajzen, 2002). According to that theory, the intention to exhibit a specific kind of behavior is influenced by a number of factors, such as attitude toward the behavior, subjective norms, and perceived behavioral control. The GUESSS project investigates the entrepreneurial intentions of university students, with the university context as boundary condition Next to the university context; the personal background, motives, and family background are investigated as antecedents.

The 2011 GUESSS survey compared entrepreneurial intentions of students in 26 countries (unfortunately, the US and India were not included). Sieger, Fueglistaller, & Zellweger (2011) report on the overall findings. They find that 11% of the students intend to start a business right after graduation, or continue in a business they already founded. Five years after graduation, this percentage grows to 34.4. They also report on significant differences between countries. For example, over 17% of students in Mexico, Argentina and the United Kingdom expect to start a business, while in countries such as Germany, China and Pakistan, this is answered by only 5% or less of the respondents. The report does not provide explanations for these differences. However, it is interesting to see how the students at the three case universities differ.

The GUESSS survey investigates the same concept as the present survey: the entrepreneurial intentions of university students. However, the GUESSS survey covers certain themes that are outside the scope of this research, such as questions relating to family background and the intentions to join parents' existing firm. Therefore, a selection of questions from the GUESSS survey has been copied into a new survey. The themes present in this new survey will be explained in the following sections.

To prevent the steering of answers, it is not made clear that the survey focuses on entrepreneurship. The survey is presented to students as concerning their career expectations in general. This way, students are not tempted to answer favorably towards entrepreneurship as a career expectation. It is explained that the survey tries to compare and find differences of career expectations among students in different parts of the world.

2.4.1. Career Expectations / Entrepreneurial Intention

The survey contains six questions related to career expectations and entrepreneurial intentions. The goal of these questions is to get insight in to what extent respondents think of entrepreneurship as a career option. For example, respondents are asked what kind of career they envision for themselves, in both one and five years after graduation. The options presented cover every imaginable career option. From an employee of a small to medium sized firm, public service, or academics, to freelancers, founder, successor, or a non-professional career (travelling, helping family etc.). Additionally, students are asked which motives play a role in their future career path. These motives range from "challenge myself", "financial security" to "realize my own dream" and several more. Respondents rate their agreement with these motives on a 7-point Likert scale.

The remaining questions ask a student how likely they think they will start a company at some point. Based on previous answers, additional questions related to their entrepreneurial intentions are presented dynamically. Ultimately, these questions should answer how many students consider entrepreneurship as a career option and how many students have already been thinking about starting a business.

2.4.2. University Offerings

The goal of the questions regarding university offerings is to find out whether students know about several university offerings related to entrepreneurship. A list of possible university offerings is presented, and students are asked to indicate whether it exists at their university or not. If they answer that it exists, respondents are asked whether they attended. If it does not exist, students are asked whether they would like such an offering.

For the university offerings that the students indicated to have attended, several statements regarding the helpfulness of the offerings are presented. Students are asked to indicate their agreement with these statements on a 7-point Likert scale. The goal of these questions is to measure the awareness of university offerings, and how students experience these offerings.

2.4.3. Personal Background

The personal background questions help to categorize respondents by asking them about their current level of study, age, which university they attend, what program they are following etc. This data helps to gain insights in other dependent variables regarding entrepreneurial intention. These questions help to make sure the samples are similar at the different universities. For example this allows us to check whether the students we are comparing are of similar average age and follow similar programs.

2.5. THREATS TO VALIDITY

There are several issues that could harm the validity of this research project. These threats will be discussed, along with the measures that will be taken to mitigate them. The four types of threats that are analyzed are: conclusion validity, construct validity, internal validity, and external validity (Cook & Campbell, 1979).

2.5.1. Conclusion Validity

Conclusion validity concerns how reasonable the conclusions are based on our data. In other words, are our conclusions credible? There are two threats: we could conclude that there is a relationship between observations, when in fact there is no relationship (type I error), or we could conclude that there is no relationship while in fact there is (type II error). Conclusion validity mostly concerns the survey analysis, where we test if there is a difference between the intentions to entrepreneurship at the three universities. As the constructs and questions in survey are based on a large, long standing survey, the reliability of the measurement instruments in order (Sieger et al., 2011). To mitigate the risk of making a type I error, the alpha level is kept low (0.05); so that there is a low change of rejecting the 0-hypothesis while there is no actual relationship. Additionally, only comparing homogeneous samples further ensures reliability. Therefore, only students with a similar background in terms of study program, age, and study level are compared.

As for the qualitative part of this research, conclusion validity is less of an issue, as it is inductive instead of deductive and it does not accept or reject any preexisting theory. It merely reports on findings in the field, and suggests new theory based on these findings. Credibility of the conclusions is ensured because the findings are thoroughly reported.

2.5.2. Internal Validity

Internal validity concerns the rigor with which the study was conducted. In the context of this research project, internal validity is mainly concerned with data collection and data credibility.

Issues regarding data credibility are relevant for data gathering regarding the university offerings. For example, only relying on the university website to identify the university offerings is not sufficient, as the website can present an overly positive image of the university offerings. Implementing data triangulation (Denzin, 1978) mitigates this threat: multiple data collection methods are combined, such as university websites, interviews with faculty, and course descriptions.

Another threat is data collector bias, which can occur when the researcher unconsciously distorts data during the collection process. This can be a threat during the interviews. It includes asking questions in different ways for different individuals or asking leading questions. Using a semi-structured interview template helps to mitigate this threat. The founder-interview protocol starts by asking several easy to answer questions regarding the company, such as questions asking the name of the company and what the company does. However, as not every founder has attended the same university offerings, the interview protocol leaves room for additional unstructured questions regarding specific offerings.

2.5.3. Construct Validity

Construct validity concerns whether we measure what we believe we measure. This purely relates to the quantitative part of the research. An example of an issue is: do other independent variables affect the outcome of the study, which were not identified? Similarly to the conclusion validity, this validity risk is mitigated by basing the survey questions entirely on a pre-existing survey.

2.5.4. External Validity

External validity concerns the generalizability of the findings. In the context of this research, it concerns whether the identified success-patterns for the fostering of entrepreneurship apply to all universities, or just happen to apply for the three specific cases that have been studied. Generalizability of the findings is enhanced because of the diversity of the three selected cases. The three universities differ greatly in terms of students, size, culture, reputation, and age. Actually, the only thing that the universities have in common is that they are universities and that they have a specific interest in entrepreneurship. Therefore, university offerings that prove to be successful at all three of these universities will probably be successful at any type of university.

One important threat that unfortunately is not properly addressed in the research design is selection-bias for the founder-interviews, which might influence the results. Due to time constraints, it is not possible to randomly select interview participants. Participants are selected based on references by university faculty and/or mentions on the university websites. This way, there is a risk that only the most successful examples are considered, as these are the companies that the universities like to put forward. These interview participants may also be prejudiced to judge university offerings more favorably than others.

3. LITERATURE ON UNIVERSITY ENTREPRENEURSHIP

The literature study focuses on previous research considering entrepreneurship in general, university entrepreneurship, and entrepreneurship education. This section presents the state of the art within these respective research fields, in order to explain relevant concepts and to serve as a basis for the case study research.

3.1. THE RESEARCH FIELD OF ENTREPRENEURSHIP

Entrepreneurial activity has a positive impact on regional economic growth. However, economists have long ignored the role of entrepreneurship. In the last three decades, entrepreneurship received increasing attention from scholars in different disciplines: agriculture, anthropology, economics, education, finance, history, marketing, mass communications, political science, psychology, sociology, and strategy (Bull & Willard, 1993).

An important problem with this multi-disciplined research attention is that scholars from one discipline tended to ignore entrepreneurship research from other disciplines. Another problem both Bull & Willard (1993) and Gartner (1990) identify is the bickering over a definition for entrepreneurship. Concluding from a literature review, Bull & Willard (1993) assert that Schumpeter's definition of economic development is the most precise definition of entrepreneurship. According to Schumpeter & Backhaus (2003), the act of *entrepreneurship* is the act of *creating a new combination of (1) the introduction of a new good, or a new quality of a good, (2) the introduction of a new method of production, (3) the opening of a new market, (4) the conquest of a new source of supply of raw materials or components, or (5) the reorganization of any industry.*

The individual who performs this function is called an *entrepreneur.* Schumpeter makes a clear distinction between an entrepreneur and a mere business owner. Everyone can be considered an entrepreneur as long as he or she is carrying out any *new combination*. He or she stops being an entrepreneur as soon as the new business is formed and he or she settles down to running it like any other person runs their business.

Shane & Venkataraman (2000) dissected the fragmented field of entrepreneurship research, and composed a conceptual framework. One obstacle they identified was that previously, definitions of entrepreneurship focused solely on terms of who the entrepreneur is and what he or she does. As they state, "*the problem with this view is that entrepreneurship involves the nexus of two phenomena: the presence of lucrative opportunities and the presence of an enterprising individual.*" Shane & Venkataraman define the field of entrepreneurship research as "*the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated, and exploited.*" On a high level, they dissect the field of entrepreneurship in the following three concepts:

- **The Existence of Entrepreneurial Opportunities**: Drucker (1985) has described three different categories of opportunities: (1) the creation of new information, as occurs with the invention of new technologies; (2) the exploitation of market inefficiencies that result from information asymmetry, as occurs across time and geography; and (3) the reaction to shifts in the relative costs and benefits of alternative uses for resources, as occurs with political, regulatory, or demographic changes.

- **The Discovery of Entrepreneurial Opportunities:** Why do some people discover particular entrepreneurial opportunities, while others do not? Of course, one explanation is simply blind luck. However, research has suggested two broad categories of factors that influence the probability that particular people will discover particular opportunities: the possession of the prior information necessary to identify an opportunity and the cognitive properties necessary to value it.

- **The Decision to Exploit Entrepreneurial Opportunities:** Why, when, and how do some people and not others exploit the opportunities that they discover? According to Shane & Venkataraman, this again relates to the joint characteristics of both the opportunity and the individual.

3.2. HISTORY OF UNIVERSITY ENTREPRENEURSHIP

Until the year 1979, research in entrepreneurship received little attention (Bruyat & Julien, 2001), and was fragmented (Acs & Audretsch, 2010). Economists considered large corporations as "*the most powerful engine of progress*" (Acs & Audretsch, 2010). However, this changed when David Birch (1979) first highlighted the role of entrepreneurship in the creation of new jobs (according to his study, entrepreneurship accounted for over 50% of all new jobs). His report attracted interest from US Congress, which realized that in order to remain competitive, the US had to invest in innovation and entrepreneurship.

Universities have always conducted applied research in conjunction with industry or government. However, legislation often made it difficult for universities to patent the results of publicly funded research. The US Congress, in an attempt to stimulate innovation in US firms to fight the increasing competition by Japanese firms, passed the Bayh-Dole act in 1980 (Grimaldi, Kenney, Siegel, & Wright, 2011), The Bayh-Dole act allowed universities to commercialize publicly funded research. While some argue that the Bayh-Dole act functioned too well, since it de-emphasized fundamental research (Rafferty, 2008), it is generally accepted that the enactment sparked the global interest in university entrepreneurship (Powers & McDougall, 2005; Rotger, Gørtz, & Storey, 2012; Rothaermel, Agung, & Jiang, 2007),. After the US, the rest of the world followed. Most countries have enacted Bayh-Dole like legislations, granting universities the right to own their intellectual property (OECD, 2003).

3.3. STIMULATING ENTREPRENEURSHIP

There is a significant body of evidence linking the level of entrepreneurial activity to desirable effects such as the competitiveness of an economy, job creation, unemployment reduction, innovation, and economic and social mobility (Praag & Versloot, 2007; Rotger et al., 2012). Therefore, governments of virtually all developed countries have put the stimulation of entrepreneurship high on their agenda (OECD, 2008).

Not all scholars agree on the effectiveness of entrepreneurship stimulating policies (Parker, 2007). Parker argues that certain government policies might backfire or rendered ineffective by the responses of entrepreneurs and financiers. However, in a more recent study assessing the effectiveness of a Danish entrepreneurship-stimulating program, Henrekson & Rosenberg (2001) find

that initiatives aimed at stimulating entrepreneurship do contribute to the survival and growth of new ventures. Entrepreneurs that participated in the Danish program have a 3 to 12% higher survival rate (measured over two years) than entrepreneurs that did not participate in such a program.

There are three major reasons why universities across the world suddenly started to care about stimulating entrepreneurship in the past few years.

- First of all, the growing social pressure on universities to broaden their traditional missions and to adopt a more proactive participation in their region's economic development. In the Netherlands, this is called 'knowledge valorisation'. A term that embodies the need for universities to make clear their contribution to society. This leads universities to define a third mission, namely to be "entrepreneurial universities" (Clark, 1998; Etzkowitz, 1998).
- The increasing inter-relation of science and technology in numerous disciplines such as Information Technology and Biotechnology, inducing more collaboration between industry and universities.
- The declining proportion of public budgets for funding traditional academic activities (teaching and research) requiring universities to search for alternative financing (Chiesa & Piccaluga, 2000).

Over time, these reasons, along with the highly successful examples of Stanford and MIT, transformed the attitude of universities toward entrepreneurship and commercially based activities in general.

3.4. DIFFERENT CATEGORIES OF ENTREPRENEURSHIP

There are multiple ways to interpret the definitions of entrepreneurship and the entrepreneur (Gartner, 1990), and different interpretations lead to different needs for stimulating and fostering entrepreneurship . For example: is someone who opens a grocery store considered an entrepreneur in the same sense that the founder of a highly innovative software product is considered an entrepreneur?

Academic literature suggests that there are multiple types of entrepreneurship. No "average" or "typical" entrepreneur exists, and it is important to distinguish between different types (Gartner, Mitchell, & Vesper, 1989). The number of different types of entrepreneurship that are identified in literature range from two, to as many as 15 (Manimala, 1996), categorized over the type of venture and the nature and source of the idea. However all authors agree that there is a definite division between two general categories: non-ambitious entrepreneurship and innovation-based entrepreneurship. Non-ambitious entrepreneurship, or small business entrepreneurship is entrepreneurship with a low to moderate ambition to grow. It focuses on the creation of small and medium enterprises (SME), serving local markets with traditional business ideas and limited competitive advantage (Aulet & Murray, 2012). An example of such a SME is a retail-shop or a small consultancy firm.

Innovation-based entrepreneurship (a term with many synonyms such as: high-growth entrepreneurship, ambitious entrepreneurship, and high-impact entrepreneurship) focuses on the creation of innovation-based enterprises. Such enterprises have a clear competitive advantage and high growth potential, often pursuing global opportunities. These firms perform the type of

entrepreneurship that is associated with a high contribution to regional economic growth (Birch, 1979).

3.5. UNIVERSITY ENTREPRENEURSHIP

It is attractive for universities to focus on entrepreneurship due to both the reported financial benefits for universities, since it allows them to commercialize their research, as well as the economic benefits for their local regions (Brennan & McGowan, 2006; Huffman & Quigley, 2002; Rothaermel et al., 2007).

In his book, Etzkowitz (2002) explains that the entrepreneurial university is created "*as universities combine teaching and research with the capitalization of knowledge. The university's assumption of an entrepreneurial role is the latest step in the evolution of a medieval institution from its original purpose of conservation of knowledge to the extension and capitalization of knowledge. As the university increasingly provides the basis for economic development through the generation of social and intellectual, as well as human, capital, it becomes a core institution in society.*"

According to Etzkowitz, the first true entrepreneurial university was the Massachusetts Institute of Technology, as it was specifically founded as a science-based university committed to the industrial development of its region.

Rothaermel et al. (2007), which performed one of the first systematic literature reviews (SLR) within the field of university entrepreneurship, purposely define university entrepreneurship in a broad way: it encompasses activities within universities related to patenting and licensing, creating incubators, science parks, and university spin-offs, and investing equity in start-ups. They analyzed 173 articles, published from 1981 to 2005 in various academic journals. Even though a period of 25 years was covered, the majority of publications appeared in the year 2000 and onwards (127 of the 173 articles). The authors attribute this recent increase due to the appearance of special issue journals focused on university entrepreneurship and the establishment of dedicated, such as the Journal of Technology Transfer.

An important issue Rothaermel et al. identified in their study is that most publications appeared outside general management journals. This limits the impact of the research field as well as the influence on managerial practice. They attribute this observation to the fact that the field of university entrepreneurship is still in the embryonic development stage.

The authors distinguished four research streams within the concept of university entrepreneurship:

- **Entrepreneurial University** views entrepreneurial activity as a step in the natural evolution of a university system that emphasizes economic development in addition to the more traditional mandates of education and research. This research stream looks at organizational designs of universities and how they inhibit or enhance commercialization of inventions. Questions asked in this research stream are: why are some universities more entrepreneurial than others? What are the barriers to universities becoming more entrepreneurial? How can universities be more successful in entrepreneurial activities?
- **Productivity of Technology Transfer Offices.** TTOs are seen as the formal gateway between the university and industry. This stream determines the level university entrepreneurship by

the productivity of its TTO. Research in this stream looks at commercial output, university licensing, information processing capacity (invention disclosures, sponsored research), royalties, and patents (number of patents, efficiency in generating new patents). Factors that have been identified to be important in explaining the productivity of TTOs include technology transfer offices' systems, structure, and staffing, as well as the different mechanisms of technology transfer, nature and stage of technology, faculty, university system, and environmental factors.

- **New Firm Creation.** This stream looks at entrepreneurial activity in relation to the rate of new firm creation (e.g. university spin-offs). Measures related to this stream are: the quantity of new firms created, their performance (in relation to funding, revenue or growth), survival/failure rates and what factors influence these variables. Scholars in this research stream found university policy, faculty, technology transfer offices, underlying technology, investors, founding teams, networks in which a firm is embedded, and external conditions to affect the creation of new firms.
- **Environmental Context (including networks of innovation)**. This stream attributes the level of university entrepreneurship to the environmental context that the university is in. It looks at the larger overall environment, such as the science park, instead of the specific university. Measures are firm performance along several dimension related to the performance of firms outside that environmental context. Incubators also play role in this research stream. An exemplary research questions is: "Does proximity to university provide new technology-based firms (NTBFs) with competitive advantage?"

Yusof & Jain (2010) performed a similar, more recent SLR on university entrepreneurship, where they analyzed 72 papers. They classified the papers into three separate research categories: entrepreneurial university, academic entrepreneurship, and university technology transfer. Unfortunately, it is not explained how they derived these three categories.

- **Entrepreneurial University**: A university that assumes a critical role towards regional economic development, with the case of MIT as the reference example (Etzkowitz, 1998). This description is in line with the definition of (Rothaermel et al., 2007). According to Yusof & Jain, there is no consensus of a definition of an 'entrepreneurial university'. Etzkowitz describes an entrepreneurial university as "*an academic structure and function that is revised through the alignment of economic development with research and teaching as academic missions."*
- **Academic Entrepreneurship**: Yusof & Jain do not provide a clear description of what academic entrepreneurship exactly entails, and conclude it consists of a large array of activities. It is related to corporate entrepreneurship, where academic entrepreneurship encompasses organizational creation, innovation, and strategic renewal (Brennan & McGowan, 2006). The topics are somewhat similar as research labeled as entrepreneurial university, but the scope is broader. Academic entrepreneurship considers all initiatives that could be described as entrepreneurial. This also includes for example external teaching, contract research, and consulting.
- **University Technology Transfer** describes the process of transferring university technology towards the private sector. By far, this topic received the most research attention (43 of the 72 papers were classified in this category). It looks at the process of commercializing

university developed technology and inventions. The concept of university technology transfer is defined as: "*University technology transfer is a step-by- step process of commercializing university-developed technology and inventions whose success is dependent on the role played by the creator of the intellectual property, the individual scientist or engineer*" (Wright, Birley, & Mosey, 2004).

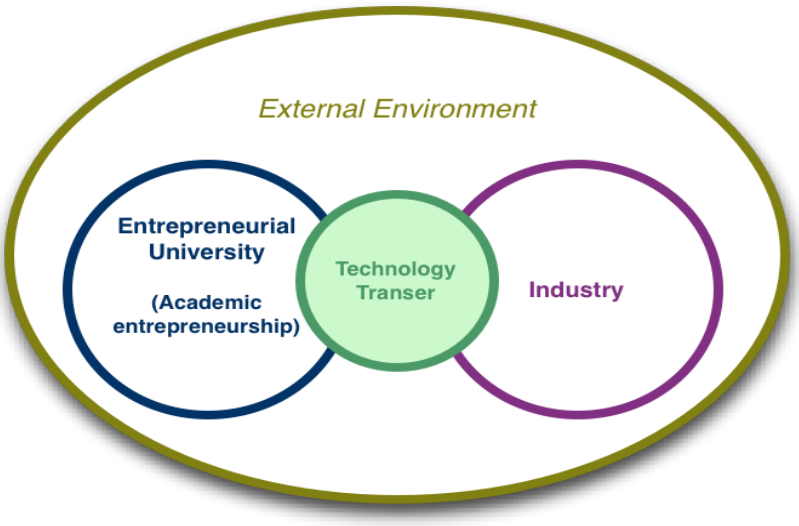

Figure 4: Framework depicting the relationship between university entrepreneurship, industry, and the external environment (Yusof & Jain, 2010)

After analyzing the publications from the three different categories, Yusof & Jain created a framework depicting the relationship between the different terms of university entrepreneurship, which is depicted in Figure 4.

As the framework makes clear, the term 'academic entrepreneurship' is seen as part of the term 'entrepreneurial university'. The authors define the relation as follows: "*An entrepreneurial university is a university that extensively practices academic entrepreneurship. An entrepreneurial university can be compared to a less entrepreneurial one by measuring the level of its academic entrepreneurship*." In other words, an entrepreneurial university carries out academic entrepreneurship. Yusof & Jain do not operationalize the term academic entrepreneurship. However, one of the papers used in their literature review (Klofsten & Jones-Evans, 2000) suggests that the academic entrepreneurship includes carrying out activities such as:

- **Consulting**: The sale of personal scientific or technological expertise to solve a specific problem
- **Contract research**: Undertaking specific research projects with the university system for external organizations
- **Large scale science projects**: Obtaining large externally funded research projects, either through public grants or through industrial sources
- **External teaching**: Provision of short courses to non-university personnel/students and external organizations

- **Testing**: Provision of testing and calibration facilities to non university individuals and external organizations
- **Patenting/licensing**: The exploitation of patents or licenses by industry from research results
- **Spin-offs**: The formation of new firm or organization to exploit the results of the university research
- **Sales**: Commercial selling of products developed within the university

Another definition of academic entrepreneurship explains the concept more concisely: *"[Academic entrepreneurship] involves the variety of ways in which academics go beyond the production of potentially useful knowledge and take some sort of leadership role in ensuring successful commercialization*" (Henrekson & Rosenberg, 2001). These authors also use a different term for university entrepreneurship: science-based entrepreneurship. Henrekson & Rosenberg link the increasing attention to science-based entrepreneurship to the 'scientification' of technology, with the rapid growing wealth-creating industries such as biotechnology and information technology as primary examples. They highlight an important problem in recent literature: generally, academic entrepreneurship is assumed to consider university faculty assuming an active entrepreneurial role. However, they highlight that graduate and even undergraduate students are also suitable candidates to run science-based entrepreneurship endeavors.

Comparing the two extensive SLRs, there are several similarities. Even though the two studies use somewhat differing classifications, it is clear that the field of University Entrepreneurship contains several distinct focus areas: University Technology Transfer (processes dealing with the transferring of inventions to the private sector), Entrepreneurial University (Entrepreneurial attitude and initiatives of the university as well as its agents), and the direct external environment that influence the entrepreneurial attitude inside the university. In the following sections, these first two focus areas will be further explained and key papers in the respective fields will be discussed.

3.6. ENTREPRENEURIAL UNIVERSITY

The entrepreneurial university is but one of the components in the framework that encompasses university entrepreneurship. It involves the direct efforts and initiatives of the university to foster entrepreneurship and innovation.

Etzkowitz (1998) defines an entrepreneurial university as follows: "*The entrepreneurial university integrates economic development into the university as an academic function along with teaching and research. It is this `capitalization of knowledge' that is the heart of a new mission for the university, linking universities to users of knowledge more tightly and establishing the university as an economic actor in its own right."*

This definition shows the broadness of the concept. For one, it suggests a focus on applied, practical research versus fundamental research. The university does no longer perform research just for the sake of research, but also considers the applicability of its research in society. Eventually this focus will lead to an increase in research with direct application in the real world, which could inspire university stakeholders, such as cooperating companies, as well as individual academics and students to license this knowledge and create new products and companies around it. This in turn could inspire other academics and students to pursue an entrepreneurial career as well.

Another aspect revolves around the direct fostering of entrepreneurship. The main issue in this aspect is how to stimulate entrepreneurship among students, graduates, and faculty. Universities employ several initiatives to foster entrepreneurship, such as setting up technology incubators, organizing business plan competitions, forming education centers and appointing chairs for entrepreneurship (Lüthje & Franke, 2003). Several studies concerning the fostering of entrepreneurship have been conducted (Franke & Lüthje, 2004; Huffman & Quigley, 2002; Liñán, Urbano, & Guerrero, 2011; Lüthje & Franke, 2003; Nab, Pilot, Brinkkemper, & Berge, 2010).

Franke & Lüthje (2004) compare two "*typical*" German-speaking universities (the Ludwig Maximilian University in Munich and the Vienna University of Economics and Business Administration) to the Massachusetts Institute of Technology on the effectiveness of the entrepreneurship stimulation of these universities. They conducted a survey amongst Business Administration students at the three institutes, and found that the intention to start a business is significantly lower with students from the German institutes compared to the students from MIT. They found the most important difference is the perception of the university environment. Students from MIT perceived the way the university fosters entrepreneurship as far more favorable than the students from Munich and Vienna. The authors conclude by making several recommendations for universities to increase the intention of their students to consider entrepreneurship.

They recommend:

- Establish entrepreneurship centers
- Focus courses on the creation of new enterprises rather than on the managing of existing ones
- Provide positive role models in teaching
- Intensify experimental learning and real-world experience with regard to critical issues in the startup process
- Establish support network with sponsors and coaches.

3.7. UNIVERSITY TECHNOLOGY TRANSFER & UNIVERSITY SPIN-OFFS

As observed in both of the literature reviews discussed in section 3.5, most publications in the field of university entrepreneurship concern University Technology Transfer (UTT). This is indeed an interesting part of university entrepreneurship, as it concerns the processes and policies that actually enable (private) enterprises to license university inventions and technology resulting from research.

Siegel, Thursby, Thursby, & Ziedonis (2001) explain how UTT increases the incidence and complexity of research partnerships. The partnerships they identify are licensing agreements, formal and informal research joint ventures, Engineering Research Centers (ERCs), Industry-University Cooperative Research Centers (IUCRCs), and university-based startups. One of the critical organizational issues within UTT is how to manage these relationships, in light of the fact that all the relevant actors (scientists, university administrators and entrepreneurs) have different motives (Siegel et al., 2001). For example, scientists seek scientific prestige and are often looking to publish research results so that others cite them. Conversely, the entrepreneur wishes to maintain the proprietary nature of the technology for as long as possible to increase profits. The university

administrator is mostly looking for a large return on the institutions intellectual property, which could slow the negotiation of licensing agreements.

The act of transferring university technology often results in the creation of university spin-offs. There is much debate as how to define university spin-offs. Pirnay, Surlemont, & Nlemvo (2003) collected all definitions used by different scholars, combined similar terms and came up with a single definition that combined all the former definitions: University Spin-offs are "*new firms created to exploit commercially some knowledge, technology or research results developed within a university*".

Authors tend to disagree over several dimensions within university spin-offs. One of them is the *status of the individual* who initiates the spin-off. Some authors consider only researchers as possible initiators of the new venture (Steffensen, Rogers, & Speakman, 2000), whilst other are less restrictive, and specify that a university spin-off can be founded by either a researchers, staff member of student (Rappert, Webster, & Charles, 1999).

Another debated dimension is the *nature of the knowledge transferred* from the university to the new venture. Some authors only consider technology-based transfers, others also include situations where certain university know-how is exploited by service-based firms (Rappert et al., 1999). This difference is based on the type of knowledge. Technology is *codified* knowledge. It is contained within an artifact such as a publication, technical report, computer program or other technical artifact. Know-how is often *tacit* knowledge. It is personal knowledge accumulated by an individual during his/her academic activities. Pirnay, Surlemont, & Nlemvo (2003) argue that a successful university spin-off consists of the transfer of both codified and tacit knowledge. Spin-offs should not only consist of a particular technology with an inexperienced entrepreneur, since the economic potential of the technology (the codified knowledge) is often not fully understood because of a lack of technical (tacit) knowledge possessed by the individual.

Pirnay et al. (2003) have developed typology that builds upon the two relevant factors: the status of the individual and the nature of the spin-off activities (product or service-oriented). The authors distinguish between students starting a company using codified (product) knowledge from the university, and tacit (service) knowledge (the things they learned during their time at the university). The authors explain the typology by providing detailed examples of how universities should support either the creation of academic product spin-offs or student product spin-offs. To support students in launching their own companies purely based on tacit knowledge, universities should:

- Emphasize on supporting the individual rather than the technology
- Support the individual in the process of launching a new venture, regardless of the potential value to be created in terms or economic repercussions or reputation from the university and the region considered.
- Students have two major difficulties when launching a company: lack of entrepreneurial background, and weak credibility versus external partners (e.g. investors). Therefore, Pirnay et al. suggest focusing on a standardized approach in the form of courses where students learn to create a business plan, to assess whether the idea can be transformed into a viable business and whether the student is willing to commit to create a firm to exploit the idea commercially.

According to the typology created by Pirnay and his colleagues, any firm created by anyone involved with a university could be considered a university spin-off, because the individual possess certain knowledge obtained during their time at the university. Because the present research focuses on the stimulation of (software) entrepreneurship among all students, even if the venture is not considered a spin-off, we will only consider a new venture as a university spin-off if it actually utilizes (codified) university research and/or technology. Therefore, ventures founded by students based around products that did not result from university research, are not considered university spin-offs. This does not imply that universities should not focus on the stimulation of entrepreneurship among students, however, as Pirnay et al. discuss, it requires a different approach than regular university spin-offs based around exploitable research projects. Whilst both important for of a true entrepreneurial university, stimulating and supporting students to pursue a career as an entrepreneur (the focus of this research) is not the same as stimulating researchers to pursue research projects that contain the ability to generate economic benefits.

3.8. ENTREPRENEURSHIP EDUCATION

> *"The entrepreneurial mystique? It's not magic, it's not mysterious, and it has nothing to do with the genes. It's a discipline. And, like any discipline, it can be learned"* (Drucker, 1985).

With these words Peter Drucker, a leading management thinker, put an end to the debate whether entrepreneurs are born or taught. This view is supported by Gorman, Hanlon, & King (1997). In their ten year literature study on enterprise, entrepreneurship and small business management education they concluded that most of the empirical studies surveyed indicated that entrepreneurship can be taught, or at least encouraged, by entrepreneurship education.

By analyzing US census data, Robinson & Sexton (1994) prove that the level of education has a positive influence on the probability of becoming an entrepreneur, as well as the success as an entrepreneur in terms of earnings. However, this study does not specifically look at entrepreneurship education. It looks at the overall level of education and finds that higher educated people more often become entrepreneurs and generally earn more than their lowed educated colleagues.

Harvard's Business School is credited as having started the first entrepreneurship course in the United States back in 1947. During the next 50 years, entrepreneurship education grew at an exceptional rate. By the year 2000, there were more than 2200 entrepreneurship or small business courses at over 1600 schools, 277 endowed positions, 44 English-language refereed academic journals and over 100 centers related to entrepreneurship (Katz, 2003). Katz analyzes this rapid growth in entrepreneurship education and subsequent research attention. He tries to predict where entrepreneurship education will go in the 21st century. He argues that entrepreneurship education in US business schools has become mature over the last 50 years. However, he finds that attention to entrepreneurship outside of business schools is, for example in engineering schools, lacked behind and only started to increase since the 1990s.

Frugier, Verzat, Bachelet, & Hannachi (2003) concludes that although engineers are often association with innovation, they create far fewer business than business school graduates. In order to help engineers to become (successful) entrepreneurs, they assert an "entrepreneurial spirit" should be created.

3.9. THE EFFECTS OF ENTREPRENEURSHIP EDUCATION

The findings proving the positive influence of entrepreneurship education on the probability of becoming an entrepreneur do not mean anyone can become a *successful* entrepreneur when they receive proper education. Not everyone has what it takes to become a (successful) entrepreneur. While many of the aspects of entrepreneurship can be taught, it also requires a certain personality and attitude towards taking risk. In fact, there is always a role for the gut feeling in entrepreneurship (Garavan & O'Cinneide, 1994). People with the necessary skills and propensity towards entrepreneurship can be called 'dormant' entrepreneurs.

In their relatively dated study on ten years of entrepreneurship education literature, Gorman et al. (1997) provide an overview of the findings of 33 theoretical and 75 empirical articles on statements related to the effect of entrepreneurship education. They categorize the findings on statements regarding entrepreneurship propensity (the inclination of an individual to become an entrepreneur), pre-startup, post start-up and education process, and structure. Although old, the findings from the literature on entrepreneurship propensity, pre-startup education and education process and structure are relevant in the context of this research. Post start-up education, which focuses on ex post education of small business management, is considered out of scope as it does not consider increasing the rate of new ventures being founded by students.

Regarding entrepreneurship propensity, the authors find that the literature contradicts in terms of the effect that entrepreneurship education has on the inclination of becoming an entrepreneur. Garnier, B., Gasse, Y., & Raynal, C. (1992) conclude that entrepreneurship education positively influences inclination towards entrepreneurship. However, Gupta (1992) concludes that entrepreneurship education has minimal impact on the attitude towards entrepreneurship. He finds that cultural conditioning and family conditioning have a far more important impact on an individual's attitude towards entrepreneurship. According to Gupta, the main benefit of formal education is the increase in self-confidence. Donckels (1991) conducted a large-scale survey amongst Belgian students, graduates, and faculty in the field of economics, regarding entrepreneurship education in Belgian higher education. He found that the most important goal for entrepreneurship education is to create awareness for entrepreneurship as a career option, as this would lead to a change in attitude towards entrepreneurship. Additionally, education should also teach the necessary knowledge and skills required by entrepreneurs. Gorman et al. (1997) concludes that further research is necessary in order to make definitive conclusions.

Martin, McNally, & Kay (2012) performed an extensive meta-analysis of entrepreneurship education outcomes. They argue that there currently is little evidence that shows entrepreneurship education helps to create more or better entrepreneurs. Most studies demonstrated positive relationships between entrepreneurship education and entrepreneurial success, but only cover a specific university offering and often do not contain a control group. Additionally, a number of important studies have shown negative results. Overall, they find that many entrepreneurship education publications contain methodological and/or reporting issues, and were therefore not included in the analysis.

They find that there is a significant positive relationship between entrepreneurship education and total entrepreneurship-related human capital assets. *Total entrepreneurship-related human capital assets* is a construct which contains entrepreneurship related knowledge and skills, the positive

perceptions of entrepreneurship and the intentions to become an entrepreneur. When looking at each category individually, Martin, McNally and Kay found the highest correlation with entrepreneurship related knowledge and skills. Smaller, but nonetheless significant, correlations were found for the positive perceptions and the intentions to entrepreneurship.

They also conclude that entrepreneurship education is positively associated with entrepreneurship outcomes. *Entrepreneurship outcomes* consist of the entrepreneurial performance of the entrepreneur and/or the company he founded. It includes nascent behaviors, start-up behaviors, as well financial success. *Nascent behaviors* are defined as behavior such as "being more likely to be self employed" and "being more likely to be instrumental in the creation of new business venture" (Charney & Libecap, 2000). Menzies & Paradi (2002) serves as an example of how *start-up behavior* is measured: if, when and how many businesses are started in relation to (the amount of) entrepreneurship education received by the student. Financial success is measured by the performance of the startup, in terms of revenue or investment, as is done in (Cruz, Escudero, Barahona, & Leitao, 2009).

Martin et al. find a positive correlation between entrepreneurship education and entrepreneurship outcomes. Following education in entrepreneurship increases the likelihood of becoming self-employed, founding a business as well as the financial performance of this business. Unfortunately, they do not provide answer to which sub-variable (nascent behavior, start-up behavior or financial performance) is affected the most. Next to a call for improved methodological rigor in entrepreneurship research, Martin et al. identify several open research challenges. One of them is content of the education and the learning goal. (E.g. is there a difference in the effect of entrepreneurial education in relation to course content?) Another future research suggestion is the course instructor: does it make a difference who teaches a course? (E.g. an experienced entrepreneur versus an academic.)

Examples of courses

Over the years, several courses on entrepreneurship have been studied and published in scientific outlets. One of the earliest examples of such a course is described in the work of Knight (1991). He presents a framework for a course on entrepreneurship, and argues that such a course should contain the following elements: opportunity identification, strategy development, resource acquisition, and implementation. These elements are similar as the concepts that were identified in the entrepreneurship framework described in section 3.1. The elements of entrepreneurship are explained to students using several illustrative cases. Additionally, individual students or pairs develop a business plan for a venture that they wish to embark on after completion of the course. Knights course does not focus on particular industries and most elements are only covered by theory. Additionally, the course does not distinguish between ambitious entrepreneurship and small business management.

A more recent example of a course on entrepreneurship at Utrecht University, is described in Nab et al. (2010). The course, which is called 'ICT Entrepreneurship', follows an authentic learning approach where entrepreneurship is studied not only by creating a business plan, but also by creating a fully functioning prototype, as well as the objective to compete against other teams in pitching the idea to a jury consisting of potential investors, experienced entrepreneurs and university faculty.

Authentic learning-based entrepreneurship education focuses on simulating the real world environment of an entrepreneur. Students deal with problems in the same way as if they are real entrepreneurs. As Nab et al., (2010) explain, this entails the simulation of the same professional contexts of an entrepreneur. The professional contexts in which entrepreneurs operate are characterized by complexity, time pressure, deadlines, uncertainty, playing several roles, ambiguous conditions, and multidisciplinary, open-ended, unstructured, hidden, and undefined problems.

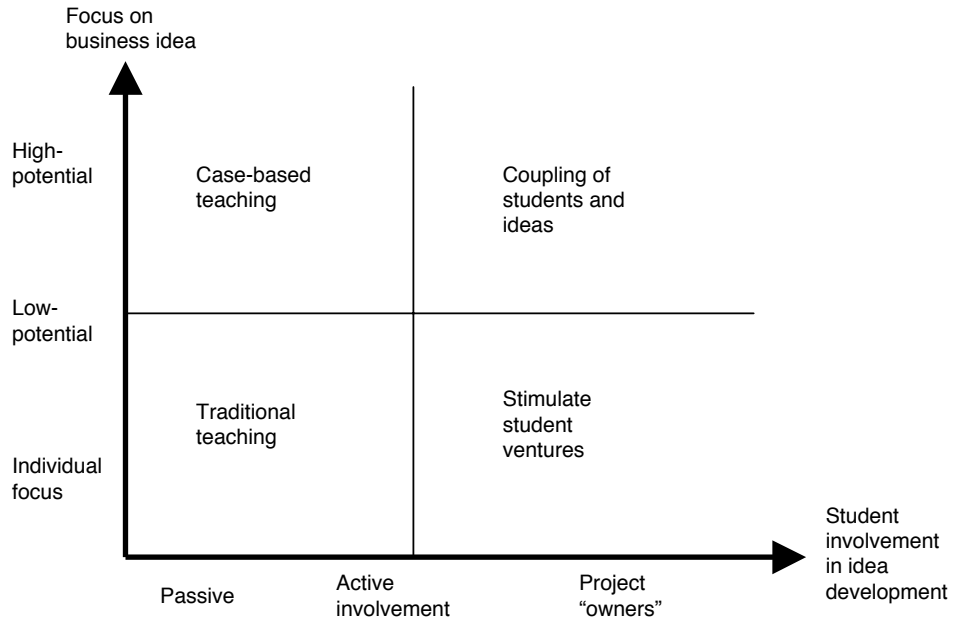

Figure 5: Teaching strategies for entrepreneurship education (Rasmussen & Sørheim, 2006)

Rasmussen & Sørheim (2006) compared six Swedish university courses on entrepreneurship. They categorized different types of entrepreneurship education based on idea-focus versus individual focus and the intensity of student involvement, as depicted in Figure 5. They find that action based entrepreneurship education is more effective in terms of stimulating entrepreneurship and teaching students the necessary skills and attitude to become entrepreneurs. Additionally, they find that 'voluntary support' from experienced entrepreneurs and business people is crucial for action-based entrepreneurship courses, as these volunteers serve as advisors or mentors for the students; they provide a network and access to that network, and serve as important role models for the students.

Rasmussen & Sørheim state that effective action-based entrepreneurship education might not be easy to implement in most university curricula, as the requirements of a start-up process do not fit into the timetable of most university studies. Additionally, the unique learning process is hard to standardize in a course descriptions.

3.10. INCUBATORS

Another mechanic to proactively stimulate the regional entrepreneurial climate is to set up business incubators in or around university campuses. In general, incubators can provide the following facilities and services towards its tenant firms (Lewis, 2001):

- A multitenant office facility with flexible space, so that emerging companies can expand (or contract) as needed during its time at the incubator.

- Office infrastructure and equipment, including high speed internet access
- Shared conference rooms & telecommunication equipment
- Interaction among tenant firms
- Mentoring programs
- Training
- Networking

Mian (1994) compares six US University Incubators. He compares factors such as origin, objective, organizational design, governance and policy, funding sources, technologies targeted, and strategic operational policies. His research provides a complete overview of how university incubators in general function, and therefore his findings are summarized here.

Mian compared the following six incubators:

- Technology Advancement Program, University of Maryland, MD
- Advanced Technology Development Center, Georgia Tech., GA
- The Ben Craig Center, University of North Carolina at Charlotte, NC
- Technology Innovation Center, Northwestern University, IL
- NET Ben Franklin Technology Center, Lehigh University, PA
- Enterprise Development Inc., Case Western Reserve University, OH

All of the six incubators were founded in the 1980s, and share the same objectives: participate in regional or local economic development, transfer university technology, and commercialize university research. Another interesting objective shared by all six incubators is to provide a laboratory for the development of entrepreneurial skills among aspiring students and faculty.

The incubators differed on their organizational design. Although they are all physically part of the university campus, the organizational relationship with the university differs. There are two main types to distinguish: one is closely linked to the university, where the incubator is part of a particular school or department, or as an independent 'department-like' entity. In other words, in this form of organization the incubator is a virtual organizational component of the respective university, and heavily dependent on the sponsoring of that university. The second type of incubator consists of stand-alone non-profit entities. Even though they established by the university, they rely heavily on private and local funds provided by the private sector in their local community.

Incubator policies and governance appeared to be overall organized in a similar way. Incubators are generally governed by a mix op both private sector as well as university management. The involvement of local business leaders helped not only by giving advice on policy, but also by providing private funds. All incubators have some form of tenant performance reviews. These helped in providing the necessary expert feedback for improved performance. Four of the six Incubators performed a formal periodic review. The two other incubators performed informal reviews, usually carried out by the incubator manager on a one-to-one basis and indirect evaluations. The formal reviews helped the management keep a sense of purpose for their facilities, as well as the client firms. The less formal reviews had an advantage that they did not temp the tenant firms to strive for short-term financial gains.

Mian concludes that Incubators have a positive impact on their tenant firms' survival and growth. However, he also highlights financial self-reliance and faculty support (as either entrepreneurs or consultants) as two issues that still needed to be realized. An interesting observation is that out of the six Incubators, four consists mostly of tenants active in the software technology sector. The two others mostly consist of biotechnology firms. Unfortunately, Mian does not explain why the software technology sector is the dominant sector over all tenant firms, other than that it is (was) an emerging technology.

In a later extensive literature review, Mian (1997) developed a framework to assess university technology incubator performance This framework was developed based on the complete body of research on university sponsored technology incubators. The framework was evaluated by applying it on the incubators studied in the previous research.

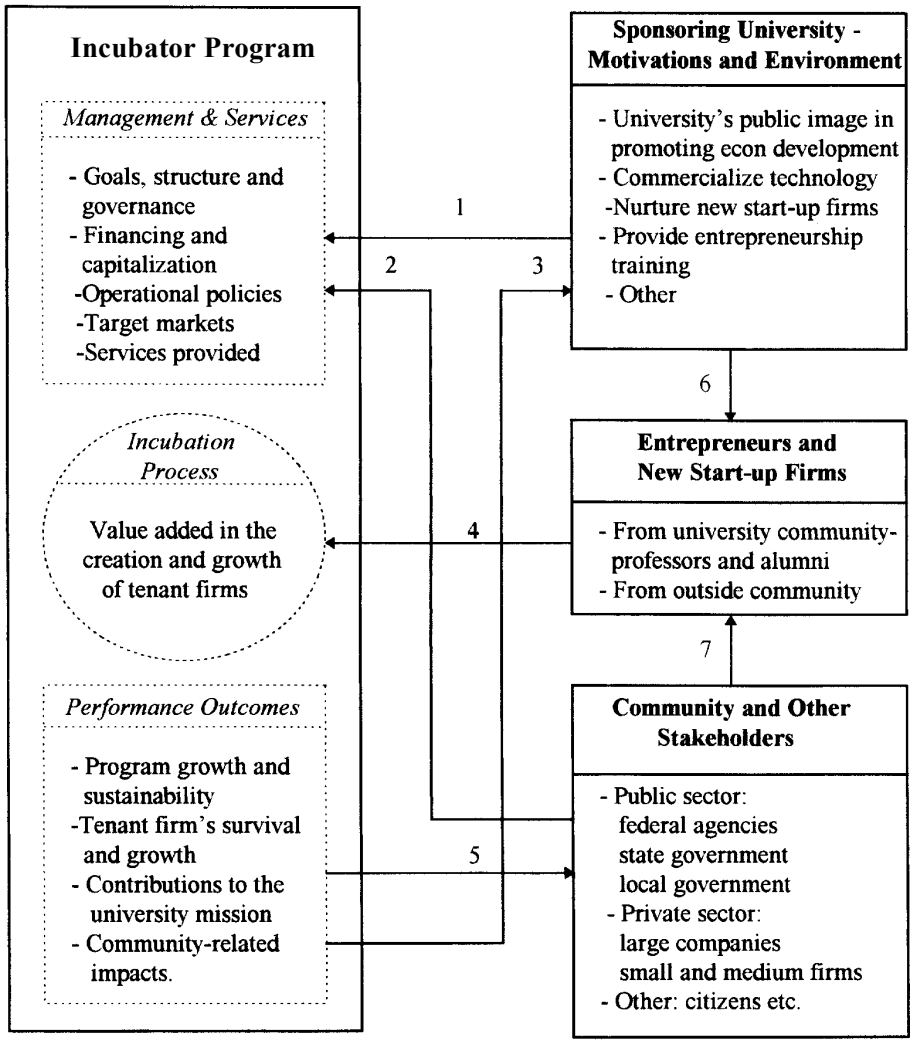

Figure 6: framework to assess university incubators (Mian, 1997)

3.11. SOFTWARE ENTREPRENEURSHIP

Not every entrepreneurial venture is the same. Startups working in different industries differ in terms of the required support, funding needs, infrastructure needs, and product development time (Ahmad & Ingle, 2011; Lewis, 2001). Companies in the software industry have relatively low upfront investment needs, as they generally have low production and distribution costs. This makes it feasible for some software entrepreneurs to bootstrap their startup (fund it yourself). Additionally, software entrepreneurship requires few resources. Developing a software product does not require a lab or expensive machinery. One or several computers often suffice. The key asset for software ventures is knowledge. And, as the product of a software company is virtual, making one copy costs almost the same as making a million copies (Cusumano, 2004). These are just some of the reasons that software entrepreneurship is different than entrepreneurship in other industries.

Because software entrepreneurship relies less on investments and physical assets, and more on knowledge and technological innovation, it is especially suitable for universities to focus on. Students (with knowledge of software development) can develop their products independently with means they often already possess. Additionally, there are several important role models and popular examples that make software entrepreneurship attractive to students. There are several examples of highly successful software companies that were started from a dorm room, such as Facebook, or emerged from a research project, such as Google. The founders of these companies did not have a lot of money, and were very similar to most other students. These kinds of famous examples inspire students to try the same. This might relate to the observation of Roberts & Eesley (2011) (Figure 7). In their report on entrepreneurship at MIT, they observe that software entrepreneurs generally start at a younger age than entrepreneurs in other industries. It can be observed that most software entrepreneurs start in their late twenties; right around the time most people finish their graduate degree. This again could relate to the relatively low asset and investment requirements of software entrepreneurs, making software entrepreneurship especially suitable for student (or recent graduate) entrepreneurs.

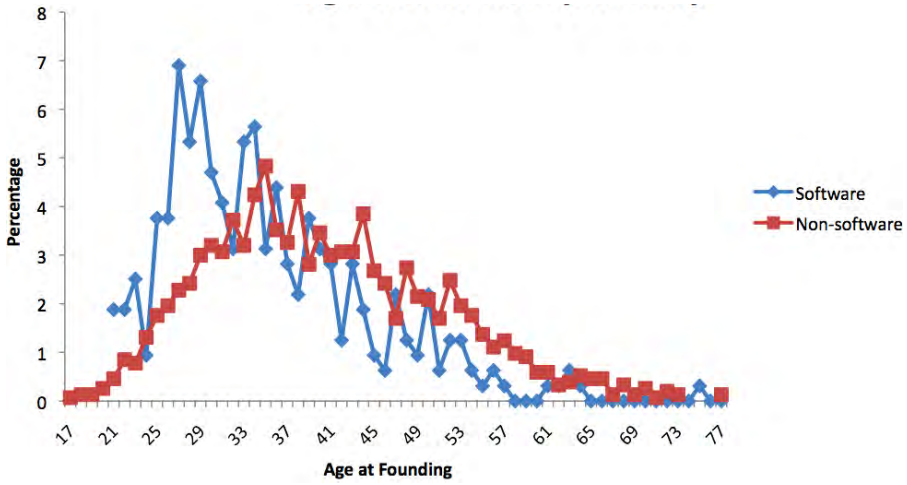

Figure 7: Age of founders by industry (Roberts & Eesley, 2011)

3.12. CONCLUSION FROM THE RELATED LITERATURE

This chapter provided a concise overview of the different streams of research related to university entrepreneurship, with a specific focus on the state of the art in research on the fostering of entrepreneurship among students. Previous research shows that the benefits of stimulating entrepreneurship are well known, and that several university initiatives, such as entrepreneurship education and university incubators, have a positive effect on the number of students that consider entrepreneurship as a career option and the survival rates of new startups. However, the literature review showed a complete lack of research that investigates how these different offerings contribute towards success. What is it that an academic course on entrepreneurship does, so that a student decides to pursue an entrepreneurial career? In addition, what incubator facilities and services do really contribute to the success of its tenant firms? The remaining chapters of this research try to provide an answer to these important open questions.

4. THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

4.1. INTRODUCTION

The Massachusetts Institute of Technology is one of the leading academic institutions in the world (Times, 2012). It is located in Cambridge, Massachusetts. It was founded in 1886 under the motto of 'Mens et Manus', which translates to 'Mind and Hand'. This motto tried to express the founder's vision of science and industry cooperating. The university was founded in response to the rapid scientific and technological advances during the industrial revolution in the mid-19th century (Stratton & Mannix, 2005). Since it's founding MIT had a focus on physical science and engineering, but over the year the scope expanded to fields such as linguistics, biology, political science, and management science. However, MIT always kept a focus on applied science and technology, and this is one of the reasons MIT has always been an institute with close ties to industry.

MIT has five schools (School of Science, School of Engineering, School of Architecture and Planning, School of Management, and a School of Humanities, Arts, and Social Sciences) and one college (Whitaker College of Health Sciences and Technology). As of the academic year 2011-2012, MIT employed over 1,000 faculty members and enrolled over 10,000 students. In the year 2011, MIT's endowment was $9.2 billion, making it the sixth largest American university.

Ever since its creation in 1886, it has a reputation of an institute that stimulates entrepreneurship. Together with Stanford University in California, MIT is seen as one of the exemplars of an entrepreneurial university. It sits at the center of Route 128, an area with an unusual high concentration of high-tech firms. Route 128 is referred to as the east-coast equivalent of California's Silicon Valley. Among the factors that influence the creation of both Route 128 and Silicon Valley, Dorfman (1983) attributes an important role to the presence of 'academic centers of excellence'. Such as Harvard and MIT in the Boston area, and Stanford and UC Berkeley in the San Francisco Bay area. Dorfman also cites the 'entrepreneurial spirit' at both MIT and Stanford as important. He states that although there is a lot of anecdotal evidence on this score, it is difficult to assess what this spirit entails (Dorfman, 1983).

During World War II, the world realized the role of technology as a critical element of wartime success. The United States invested heavily in defense research and development, and with the help of enormous government funds, MIT transformed into an elite research and development center, which redirected its focus on specific practical technologies to win the war. The institute was heavily involved in the development of wartime radar technology, as well as inertial missile guidance systems. The world war, the subsequent cold war, and the years that followed, helped transform MIT into a leading institute of applied technology. Additionally, some of the defense-related inventions that came out of MIT research were transferred to some of the first university spin-offs (Roberts & Eesley, 2011).

In an attempt to define and quantify this entrepreneurial spirit at MIT, Roberts & Eesley, published several reports since 2003 on the role of MIT in relation to entrepreneurial impact (Roberts & Eesley,

2011). These reports are mainly based on large surveys sent to all MIT alumni in 2001, 2003, and 2006. Roberts & Eesley (2011) estimated that if all active companies founded by currently living MIT alumni would form an independent nation, their revenues would make that nation at least the 17th largest economy in the world. A large survey among MIT alumni found that, as of 2006, there are 25,800 active companies founded by MIT alumni that employ 3.3 million people and generate nearly $2 trillion in revenue.

Next to explaining the economic impact of firms founded by MIT alumni, the report also extensively describes programs, courses, clubs, and other initiatives at MIT that directly contribute to the entrepreneurial spirit among MIT students. The authors dubbed it MIT's *entrepreneurial ecosystem*.

4.2. DATA GATHERING

This ecosystem, and the related offerings described in the Entrepreneurial Impact report were used as a starting point into the investigation of entrepreneurship stimulating initiatives at MIT. The data has been further corroborated and extended through a document study on course descriptions and MIT websites, as well as three exploratory interviews with MIT faculty directly involved with the identified programs, centers and courses. The faculty members that have been interviewed are listed in Table 2. The three unstructured interviews had a duration of one hour each and focused on the several entrepreneurship related offerings identified in the offerings, as well as possible new offerings when mentioned by the interviewees.

Table 2: Interviewed Faculty at MIT

Name	Role
Edward B. Roberts	Founder & Chair of Center for Entrepreneurship, Entrepreneurship Evangelist at MIT
Jose Pacheco	(Former) Program Manager Center for Entrepreneurship
Bill Aulet	Managing Director Center for Entrepreneurship
Joost Bonsen	Lecturer of several entrepreneurship courses at the MIT Media Lab

As explained in chapter 0, the purpose of the document study and faculty interviews are to compile a list of university offerings related to entrepreneurship, along with their purposes. These university offerings were then presented to a number of founders who have studied at MIT, and later went on to found a company. The results of these founder interviews are presented in section 4.4. The six founders that have been interviewed are listed in Table 4: Interviewed Entrepreneurs at MIT. During these structured interviews, the founders were asked some general questions regarding their company, their co-founders, and their personal history. Additionally, the founders were asked about their experiences with the identified university offerings. In this chapter, the offerings and the related experiences and evaluations by founders from MIT are presented. In chapter 0, the MIT offerings will be compared against the offerings from the other two universities.

4.3. ENTREPRENEURSHIP AT MIT

MIT has a reputation of being an entrepreneurial university, although evidence is mainly anecdotal, and scientists find it hard to assess (Dorfman, 1983). There are several popular examples that relate MIT to entrepreneurship; probably the most striking example is the number of well-known companies that have been founded by MIT alumni, such as Intel, Texas Instruments, 3Com, Qualcomm, Bose, Genentech, Dropbox, and Campbell Soup. Some of these companies have been founded almost a century ago, however Roberts & Eesley (2011) present evidence (Figure 8) that over time more and more 'first-time' firms are founded by alumni (first-time indicating that the it is the first time a founder founded a business). The steep linear line in the graph shows that students at MIT have become more likely to become an entrepreneur than a few decades ago, and the number firms they found is ever increasing.

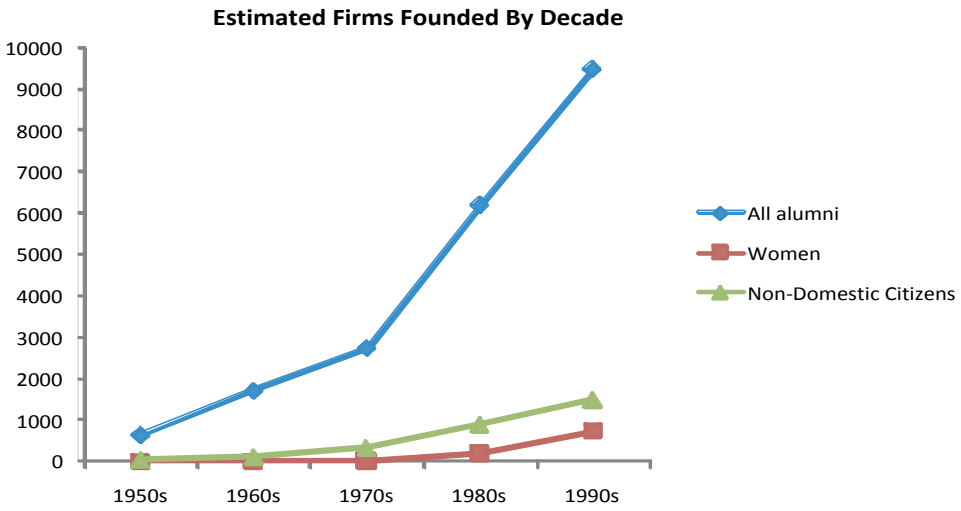

Figure 8: Estimated number of 'first-time' founders each decade by MIT alumni (Roberts & Eesley, 2011)

Next to more students becoming entrepreneurs, students have started to found businesses sooner after graduation (Figure 9).

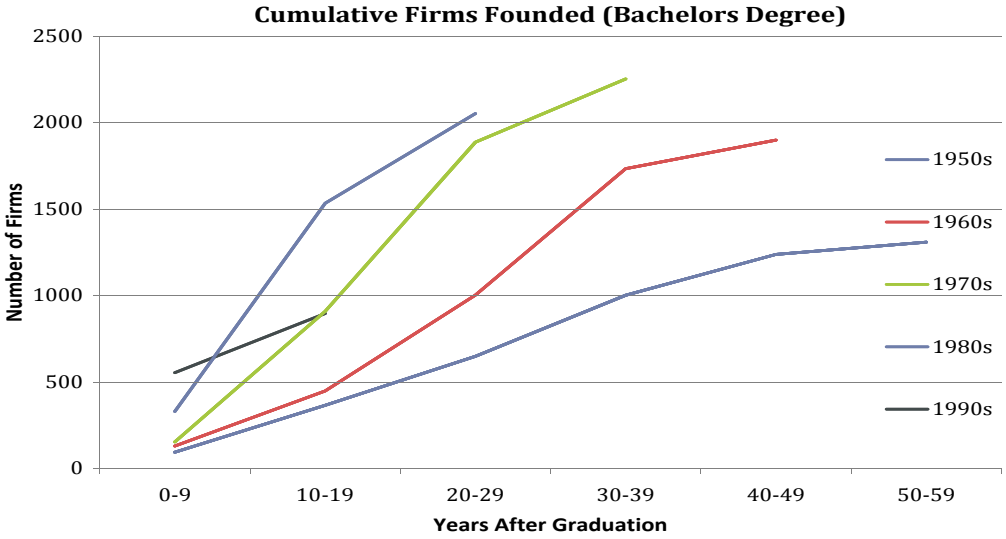

Figure 9: Firms founded by years after graduation for each decade's cohort of alumni (Roberts & Eesley, 2011)

One question asked to the three faculty members during the faculty-interviews was: "*Are MIT students more likely to become entrepreneurs than students from other universities?"* The three interviewees unanimously confirmed that they believed this was the case. Their argument was *self-selection bias.* When they decided to apply, MIT students self-selected on the propensity towards entrepreneurship. They choose to attend MIT because they already have a positive attitude towards entrepreneurship and MIT is, according to their perception, the best place to go if you intend to become an entrepreneur. Edward B. Roberts, founder and chair of the Martin Trust Center for MIT Entrepreneurship explained: *"Students at MIT have self selected themselves to come here because of the reputation that MIT is the place in which an entrepreneur will be able to be better bred, and advanced and the like. And that has also become true of staff and faculty as well, which contributes to the students. Over a long period of time, the environment has changed in the same direction."* In other words: People come to MIT because it is known for educating entrepreneurs.

Roberts & Eesley (2011) call this phenomenon a positive feedback-loop: "*The more entrepreneurs MIT produces, the stronger the entrepreneurial environment and reputation, the more likely entrepreneurs, both students and faculty, are attracted to come to MIT*". In their 2003 survey they asked respondents why they chose to attend MIT. Table 3 clearly shows the increase "*the entrepreneurial environment*" as a reason in the past few decades.

Table 3: Role of MIT's positive feedback loop in venture founding (Robert & Eesley, 2011)

Proportion of founders who chose MIT because of its entrepreneurial environment (percentage)					
Graduation decade	1950s ($N = 207$)	1960s ($N = 313$)	1970s ($N = 373$)	1980s ($N = 315$)	1990s ($N = 214$)
Chose MIT because of its entrepreneurial reputation	17	12	19	26	42

4.3.1. The MIT Enterprise Forum

What has changed so that MIT students have become more likely to start a company and start these companies earlier? Roberts & Eesley (2011) attribute the shift to the rise of what they call the "entrepreneurial ecosystem" in and around MIT, and trace back the start of it to alumni initiatives in 1969 and the early 1970s. MIT alumni started hosting seminar sessions on "starting and building your own company". Due to extreme popularity, with over 300 attendants, the alumni association had to organize additional seminars, and it quickly spread to over eight other cities across the United States, hosted by local MIT alumni. This eventually evolved into the present day MIT Enterprise Forum, with local chapters all over the world run by local MIT alumni. The Enterprise Forums hosts sessions with a diverse set of themes and subjects such as: start-up clinics, entrepreneurial finance, choosing the right venture capitalist, technology commercialization, a special interest group on software entrepreneurship and a group for digital media.

4.3.2. Martin Trust Center for MIT Entrepreneurship

By the year 1990, MIT still had only one class related to entrepreneurship (New Enterprise), and one faculty member doing research in the field of entrepreneurship. Edward B. Roberts proposed to create a MIT-wide entrepreneurship program, with a goal to "*educate and develop those who will create, build, and lead tomorrow's successful high-tech ventures.*" Its goal was to increase the MIT entrepreneurship courses and student activities and to provide central coordination and integration for these offerings. Although housed in the Sloan School of Management, the envisioned Entrepreneurship Center intended to promote cross-campus collaboration with the four other schools of MIT. This way it could connect the business-oriented students with the science and technology students.

In addition to coordinating education and student activities, the Entrepreneurship Center also promotes *"rigorous scholarly pursuit of knowledge underlying entrepreneurial success, with effective transfer of that knowledge into practice."* Therefore Roberts proposed to appoint dual-track faculty: tenure-track academics in the field of entrepreneurship along with practitioners that have been successful entrepreneurs and venture capitalists. Academic faculty that focus on entrepreneurship from a different discipline base, such as marketing, finance or human resources, for example, are jointly appointed to both their underlying discipline group as well as to the Technological Innovation, Entrepreneurship & Strategic Management (TIES) research group at the School of Management, which is the group that provides overall program coordination.

In November 2011, the Entrepreneurship Center was renamed to the 'Martin Trust Center for MIT Entrepreneurship', in response to a generous donation by an MIT alumnus and entrepreneur, Martin Trust. According to William "Bill" Aulet, the current managing director of the center, the Martin Trust Center "*educates, nurtures, networks, and celebrates entrepreneurs*". In a presentation introducing the E-Center, its mission is explained in more detail: "*to build capability and inspire MIT's men and women to become the next generation of entrepreneurs who create successful, innovation-based, new ventures worldwide*. *To accomplish this mission we educate students, nurture their entrepreneurial development, leverage MIT's network to accelerate their growth, and celebrate their entrepreneurial efforts and successes. We also pursue rigorous research and thought leadership in the area of innovation-based entrepreneurship."*

The following offerings were identified at the Martin Trust Center:

- **Meeting place:** The Trust center nurtures student-entrepreneurs by providing them with a place to go, a place where they can work and meet other entrepreneurs. This space is meant to be inviting, accessible, and informal. *"It is a nice place, a fun place. We don't have a bunch of old white guys on the wall staring down on you with suits and ties on. It is a place where there is a lot of laughter."*

- **Office space:** The Martin Trust Center offers a common working space, office space for teams, meeting rooms, conference rooms etc. Students cannot only work there on their start-ups, but also on course work and extra-curricular activities. Students do not need to apply before they can come and work in the entrepreneurship room. Any current MIT student can work there.

- **Education:** The education takes place in the form of courses part of the curriculum (several of which will be discussed later), but also in the form of extra curricular activities, such as study trips. The Trust center coordinates most educational offerings. As Aulet explains, the courses teach *entrepreneurial skill*.

- **Mentoring**: The Trust center provides coaching. At first, students can meet with the program manager ("*the primary care physician*"), he points them to the right people, such as entrepreneurs in residence, and gives them initial advice. The entrepreneurs in residence are people with extensive experience founding companies. They spend a day or so per week at the Trust center, and offer unbiased advice to the students.

- **Business Plan Competitions and other student clubs:** The Trust center provides a home to several student-run competitions and clubs, such as the $100k competition and the clean energy prize. These competitions are completely organized by students. However, Trust center staff oversees this organization and guides the student organizers. Several of these initiatives are described in the following section.

Aulet calls the mentoring activities and business plan competition 'nurturing' the entrepreneurs, with the goal to transform skill into capabilities: *"We take those skills* [acquired through education] *and turn them into real world capabilities that they have tried and tested*". In addition, the Martin Trust Center facilitates networking within and around MIT. "*We network them to help them get customers and additional resources. It is always a challenge for student-entrepreneurs to get resources*". Another important role of the Martin Trust Center is the celebration of entrepreneurs. "*Celebrating entrepreneurs gives* [the students] *the spirit and ultimately the confidence to become an entrepreneur. They believe that they can be an entrepreneur."* This celebration is done through events and publicity, specifically through awards and publications such as the MIT Entrepreneurship Review and the MIT Digital Shingle Project, an online "*experience*" with data about all MIT-related startups and their stories.

Aulet mentioned an anecdote referring to a research paper that he had recently read (Witt, Linkenauger, Bakdash, & Proffitt, 2008). "*If a golfer perceives a hole to be bigger, even if it is actually the same size, he automatically improves his stats by 20%. If you believe you can do something, you are more likely to be successful."*(Actually the authors do not present a causal direction, they do not answer whether golfers putt better and, therefore, see the hole as bigger, or they see the hole as bigger and therefore putt better, so the anecdote is not completely accurate, but still relevant as to what the e-center tries to accomplish).

Even though the kind of support the Martin Trust Center offers bares close resemblance to the offerings of an incubator, MIT does not consider it as such. "*We do not use the I-word*", Aulet stresses. An incubator is considered a commercial party, and the Martin Trust Center does not want to be associated with commercial interest. "*Our mission is education and nurture, not commercialization. This is not a place where you come to reduce your rent, this is a place where you come and learn to be an entrepreneur. I don't really know what an incubator is, but it has commercial connotations, and we don't want that. We do not invest in companies either. Although we realize that a lot of what we do here is similar to what an incubator does"*

One thing that distinguishes the Martin Trust Center as something different than an incubator is that it does not provide seed funds. "*If we provide seed funds, if we take an equity position, that is not consistent with our educational mission. If we invest in A and don't invest in B than people say, "what is wrong with B"? It is like in a family, you love all your children. We help everyone: our job is education. We would run in all kinds of problems if we start investing in companies."* Aulet continues to explain that the E-center acts as a honest broker, and the center as well as any individual involved is expected to not get involved with any of the companies that come to the E-center for support.

The Martin Trust Center is not organized around any predetermined theory on how to effectively foster entrepreneurship. However, the offerings are organized around specific phases in early startup life. The ultimate goal for the E-Center is that the startup achieves 'skate-ramp velocity': enough speed to keep on going and achieve economic success without further support from the E-Center. A graph illustrating this 'entrepreneurship ramp' and its phases is shown in Figure 10.

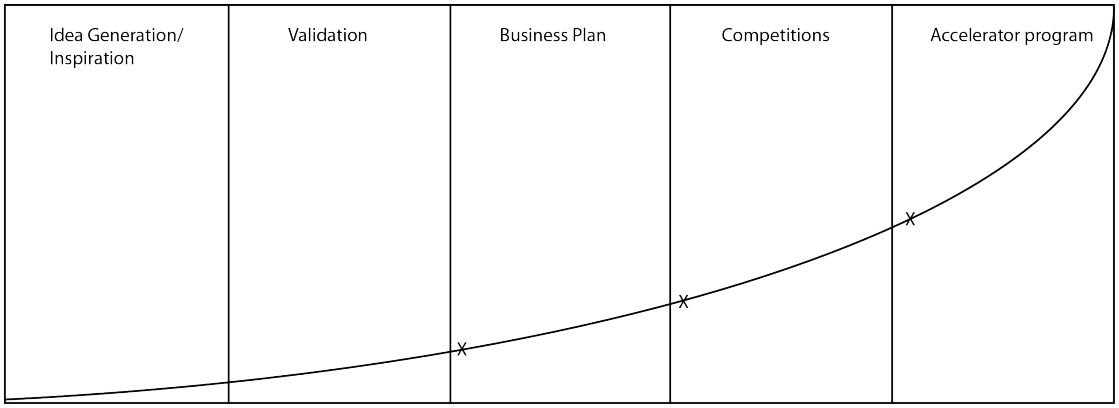

Figure 10: Entrepreneurship ramp (Aulet, Personal Communications, April 18, 2012)

The ramp distinguishes five phases, each phase requiring additional effort from the team:

- **Idea generation/inspiration phase**: a person or team gets inspired to pursue a certain idea or technology, and believes it could become a viable business.
- **Validation phase**: During this phase the entrepreneurs get consultation through the E-Center. They speak to the program manager he may suggest them to meet with other people, such as Entrepreneurs in Residence. This phase is about identifying whether the idea has potential and whether this is really something the entrepreneur wants to do. During this phase, could also participate in one of the monthly Venture Creation 'Hackathons' to test whether the idea might work.
- **Business Planning phase:** During the business plan phase the entrepreneurs start working towards a real business plan, and start planning to execute it. This gives them the opportunity to assess whether there are customers out there that are actually interested in their product. For the business plan phase several courses are provided, such as I-Teams and New Enterprises.
- **Competition Phase:** After the creation of a business plan, teams can then participate in competitions. This phase requires a higher level of commitment. Teams get critique and feedback on their business plans, meet mentors, and obtain new contacts. This phase is used to find out whether you have the right team and if the team really wants to continue. Example competitions include the MIT 100k competition and the Clean Energy prize.

- **Accelerator Phase:** During the summer, the Trust Center recently started to offer a business accelerator program. During the summer months, teams get the opportunity to work on their business in a professional environment under the guidance of experienced mentors. This 'Founder's Skill Accelerator', as it is called, provides participating teams with office space, mentoring and funding during the summer months. The funding is provided as a sort of scholarship, for the students to cover rent and other living expenses during the summer months. It is not an investment in the company itself.

The X-marks in the figure denote points where the E-Center urges entrepreneurs to consider their teams. Aulet mentions reconfiguring the team is one of the most important aspects of creating a good startup. In the initial startup phase it is less costly to change members. Founders are encouraged to constantly review whether this team is the best possible team, and optionally reconfigure the team during the points marked with an X.

The model depicted in Figure 10 is not scientifically validated, and is constructed based on experience and observations on startups at MIT. It helps the Trust center at MIT with coordinating the different activities in order to foster entrepreneurship as efficient as possible. It is interesting to see how this model compares to the offerings at IIIT-Hyderabad and Utrecht University. Possibly, the results allow us to adapt the MIT model to a general model for the fostering of entrepreneurship at universities.

4.3.3. Education

The Martin Trust center coordinates education in entrepreneurship. The education is mostly comprised out of courses that teach entrepreneurial skill, and several business plan courses. Across the different schools at MIT there are many different courses that contain some elements of entrepreneurship. Most of these courses are highly similar, but geared towards specific themes. It is not relevant and feasible to list them all, as the contribution to the success of startups of every single course is not measurable. However, the document study and interviews highlighted several courses that have a more significant contribution to the entrepreneurial ecosystem at MIT, due to their popularity, novelty, or the number of ventures that came out of the course. The courses that are described in this section are:

- **New Enterprises**
- **I-Teams**
- **Entrepreneurship lab**
- **The Business of Software and Digital Platforms**

Roberts & Eesley (2011) distinguish two types of entrepreneurship courses at MIT: academic courses, taught by "tenure track" faculty, and practitioner courses taught by experienced and successful entrepreneurs. The academic courses deal with entrepreneurial subjects with an underlying disciplinary basis. One of such courses is "The Business of Software and Digital Platforms", a Management School course focusing on the software industry. Other examples include Entrepreneurial Finance, Corporate Entrepreneurship, and Strategic Decision-Making in the Biomedical Business.

Practitioner courses depend entirely upon the experience of successful entrepreneurs and venture capitalists. The practitioners share their insights in aspects of entrepreneurship that often lack established academic theory. Those courses include the previously mentioned New Enterprises course, in which teams of students develop a complete business plan for a new venture. Other examples are "Technology Sales and Sales Management", "Early Stage Capital", "Social Entrepreneurship" and "Developmental Entrepreneurship". The latter two are designed in a similar way as New Enterprises, however with a specific context/focus.

New Enterprises

Category: Business Plan Course
Course Code: 15.390
Course description: entrepreneurship.mit.edu/course/15390-ab-new-enterprises

One of the prominent entrepreneurship courses at MIT is called New Enterprises. This course is credited for having served as a basis for the launch of numerous successful companies, such as: A123 Systems, HubSpot, OnChip Power and LARK Technologies. It is unknown when MIT started this course exactly. However, the course website mentions it has been around for "decades" (it was the only course related to entrepreneurship already offered before the launch of the Entrepreneurship Center).

The goal of New Enterprises is not only to study entrepreneurship, but also to give students the opportunity to create a business of their own. Over the course of one semester, students form teams and develop a business plan and investor pitch for a new innovation-based venture. The course tries to let students experience the problems and opportunities that entrepreneurs will encounter during the first two to three years of starting. "*We run this course with idea that we do not talk about what an entrepreneur does, we become entrepreneurs,"* explains Howard Anderson, one of the lecturers, in an introductory video. The course is given at the Sloan School of Management. It is open to all MIT students, and is a required course for the MBA students following the dedicated "Entrepreneurship and Innovation track". The course uses the book "Technology Ventures: From Idea to Enterprise" (Byers, Dorf, & Nelson, 2010) as a basis for the development of the business plans.

The course starts with students having to submit ideas for a potential company. Each student has to submit three ideas. Each idea has to contain an application or development of a technology. Ideas for consulting businesses or franchises/local versions of existing companies are not allowed. Then students have to post their resume, and seek out other team members by looking for students with complementary skills based on their resumes. The goal is to find a team of three students with diverse skills but also a similar level of commitment and interests. Through final elevator pitches the best ideas are selected and the final teams are formed.

Before the teams start to develop their business plans, they are asked to find a team advisor. This team advisor is ideally a "*thought leader that has relevant industry experience*". He can be an alumnus, executive from a former employer, entrepreneur in residence from the Trust Center, or any other contact. However, MIT faculty is not allowed to serve as team advisor. The idea behind finding an external advisor is that it provides experience in recruiting and working with an advisory board, a crucial part of any new venture, according to the course lecturers. The team advisors help the teams to prepare each business plan section, and provide feedback for each section when it is completed.

The remaining deliverables during the course are sections of a business plan. These section include: Target customer, Value Proposition, Market Analysis, Product, Competitive Advantage, Go to Market strategy and Finance. In the end these sections are combined in a complete business plan. Whether the student-teams continue with their new venture, is entirely based on their own motivation and the potential they see for the business. However, it is not uncommon that teams sign up to participate in the MIT $100K Business Plan Competition with the business plan created during New Enterprises. Not coincidentally, New Enterprises provided the majority of the $100K winners over the past two decades.

I-Teams

Category: Business Plan Course (sort of)
Course Code: 10.807/15.371
Course description: entrepreneurship.mit.edu/iteams/

Another interesting course related to entrepreneurship is Innovation Teams, more commonly referred to as I-Teams. The course is a cooperation between the Sloan School of Management and the Engineering School, and was conceived at the same time as the Deshpande Center, which will be discussed later. I-Teams couples student-teams with cutting-edge MIT research projects. The teams are asked: "*Here is a technology. Now what?"* Over the course of a semester, these teams will explore possible ways to commercialize this MIT research. The goal of this course is to teach students about technology commercialization strategies. The members of each team have mixed backgrounds, combining people with business and engineering skills. The cross-disciplinary teams are assigned a coach from the lab and a business mentor.

The goal is not to develop a complete business plan. I-Teams is not considered a business plan course, as it deals with technology instead of business ideas. Therefore, the students are not asked to develop a business plan, but instead provide recommendations on how their technology could provide impact. These recommendations could either be: start-up (spin off), partnership, licensing to industry, further research in the lab or nothing at all. The teams have to consider an application domain for their technology and apply extensive analysis on that application domain. Overall, the students learn how to discover and analyze (opportunities for) innovation.

Many other courses have been developed in the same form as I-Teams. One of these courses is Energy Ventures, a mixed-team action-learning course with real world programs focused on energy. It encourages the growing student interest in entrepreneurship based upon sustainable technologies, with energy ideas and new technologies coming from MIT faculty laboratories and graduate students.

Entrepreneurship Lab

Category: Entrepreneurial Skill
Course Code: 15.399
Course description: entrepreneurship.mit.edu/elab/

Entrepreneurship Lab (E-Lab) is a course where teams of four students from mixed backgrounds (science, engineering and management) are paired with local high tech startups. The students spend one day a week on-site with top-management of the startup in order to gain experience in starting and running a new venture. During these days they support the management by focusing on market selection, market entry strategies, sales approaches

etc. It provides students with ways to put their theoretical knowledge in to practice. The intent is to work on a problem "that keeps the CEO up late at night". It provides them with exposure to a real business environment and experience what it is like to work in a small startup environment. Basically it is a kind of internship at a startup, in the form of a single course.

This way of learning is called "action-learning", and MIT provides many courses that apply this principle, not all related to entrepreneurship. Next to E-Lab, there is a G-Lab, which stands for Global Entrepreneurship Lab, where students work with startups outside the United States; a China Lab, where students cooperate with Chinese students and work on a specific project for a host-company in China and an India Lab, which is similar to China Lab, but focused on India.

The Business of Software and Digital Platforms

Category: Industry Focus
Course Code: 15.358
Course description: entrepreneurship.mit.edu/course/15358-business-software-and-digital-platforms

As explained previously, MIT provides both practitioner and academic courses. The academic courses academic courses deal with entrepreneurial subjects with an underlying disciplinary basis. The Business of Software and Digital Platforms is an example of such a course, which deals specifically with entrepreneurship in the domain of software products and software platforms. Through a seminar format, it covers the history of software, its transformation from services to standardized products, the transition to platform strategies, cloud computing and other relevant themes. In the meanwhile it tries to uncover the business strategies of major players in the different sectors of the software business. Summarizing, it provides insight in how to do business within this particular industry. Several other courses provide similar insights in other industries, such as the biotech and health industry.

4.3.4. Business Plan competitions

Another important factor in MIT's entrepreneurship-related offerings are the business plan competitions. The best-known and longest-running competition is the MIT $100K Entrepreneurship Competition. It was created by students around the same time as the launch of the Trust Center. In 1990 it launched as a $10k Business Plan Competition, organized by the MIT Entrepreneurs Club, a student club consisting of mostly engineers, and the MIT Sloan School's New Ventures Association. The goal of the business plan competition is to encourage students and researchers in the MIT community to "*act on their talent, ideas and energy to launch tomorrow's leading firms*". 54 teams competed in the first edition. The Trust Center secured several years worth of funding for the prize-money. This way, the organizing students could spend their resources towards further building the scale and quality of the competition. Due to additional donations from alumni, the amount of prize money increased over the years from $10k to $50k to the current $100k.

The MIT $100k Entrepreneurship Competition runs every year and is divided into three separate contests:

- **Elevator Pitch Contest (EPC):** A pitching contest where teams pitch a business idea in 60 seconds in front of jury of investors.

- **The ACCELERATE Contest**: Over the course of two months, teams work to create a demo of their idea, and present it during a finale show. During the two months of the program, the teams receive resources and mentorship to help develop the demos.
- **Business Plan Contest (BPC):** The final competition, were teams complete their idea. After submitting the business plans, several semi-finalists are selected. These teams receive formal mentorship and an expense account to refine their idea. Finally, the teams pitch to a group of judges. The winner of this competition wins a check for $100,000.

All three interviewed faculty members agree that the $100k Competition is one of the most important influences on stimulating entrepreneurship within the MIT community. Among their arguments they state that: "*It is completely run by students*", and it provides "*an important source of funding*". Several other stated benefits of the $100k Competition are:

- **Networking**: it links the student-teams to entrepreneurs, investors, and potential partners.
- **Mentorship**: during the competition teams receive mentorship from "*seasoned professionals*".
- **Feedback**: The teams receive content rich feedback on their business models from "*world-class entrepreneur, investors and professional service provides*".
- **Media Exposure:** Participating teams receive wide media exposure during the competition, through news articles and TV coverage of the events.

4.3.5. Additional offerings

The MIT Founders' Skills Accelerator

As of the summer of 2012, the Martin Trust Center launched a new pilot program, which is called the MIT Founders' Skills Accelerator. During the summer, from June 4th till August 31st, several student teams get the opportunity to work on their startup idea. The kind of teams that are eligible are teams with a solid idea, but no real traction yet, and no funding. Examples are teams that have participated in the $100k competition, or worked on their idea during courses. The teams are provided with dedicated office space at the Martin Trust Center, a monthly monetary fellowship of $1.000 to cover living expenses, mentoring, and a $20k award per team upon completion of pre-determined, customized milestones. These milestones can range from customer-goals, product goals, team goals, or financial goals. Teams have to apply and submit their milestones in advance and are later finalized in cooperation with an advice committee.

Venture Mentoring Service

The MIT Venture Mentoring Service (VMS) supports entrepreneurs in the MIT community. It matches prospective entrepreneurship with experienced (volunteering) mentors. It was launched in January of the year 2000, on the premise that "*a fledgling business is far more likely to thrive when an idea and a passionate entrepreneur are matched with proven skills and experience.*" The VMS offers this mentoring free of charge to any MIT student, alumni or faculty with a business idea. When a prospective entrepreneur applies for the VMS, he or she is matched to one or several mentors, and a first mentoring session is arranged. From there, the entrepreneurs, together with the mentors, decide on meeting frequency. VMS Mentors offer advice on issues such as product development, marketing, intellectual property law, finance, human resources, and founder's issues.

Roberts states that one of the most important success factors of the VMS is the strict mentoring agreement. "*It is very strict enforcing non-conflict of interest behavior, cause that is what I felt would become one the major threats of that organization. The VMS has become a terrific organization. Very important, doing very good work, having a good influence on entrepreneurship."* The kind of mentoring the VMS offers is different than what the Entrepreneurship Center offers. Where the entrepreneurship center offers introductory connections to entrepreneurs in residence and angel investors, the VMS offers a more long-term connection to dedicated mentors. *"The VMS learned how to do that so well, so that essentially now we provide the introduction connections, but in order to establish a more long term connection, we would advise students to go the VMS."* Pacheco added.

The Deshpande Center

In January of 2002, a generous donation of $20 million from MIT alumnus and accomplished entrepreneur Gururaj "Desh" Deshpande marked the launch of the Deshpande Center. The Deshpande Center is housed within the School of Engineering. Its purpose is to fund "*leading-edge*" faculty research on technology with an expected high potential for commercialization. A committee consisting of MIT faculty, local entrepreneurs, and venture capitalists awards the funds annually. The Deshpande Center provides "Ignition Grants" of up to $50.000 for exploration and proof of concept of technologies. Additionally, it provides "Innovation Program Grants" of up to $250.000 to further develop the ideas from the "*invention stage*". The Deshpande Center is also, together with the Martin Trust Center, involved in running the I-Teams course previously described.

Since it's founding in 2002 (up until the end of 2010) the Center received 400 research proposals, has provided $11 million in grants to more than 80 projects. In total 23 companies have been formed from these projects, who have together raised over $220 million in capital investments and employ more than 250 people. The activities of the Deshpande Center are summarized as: Select, Direct and Connect: Select innovative research proposals that could promise commercial impact; Direct the research ideas toward the market; and Connect the faculty and their research endeavors to markets and financing. According to Roberts, what makes the Deshpande Center so successful is not its funds, but it is the fact that it is a visual place that is dedicated to the funding of faculty research if it has a high probability of commercialization.

The Entrepreneurship & Innovation Track

Along with the start of the MBA Class of 2008, the Sloan School of Management launched a new track dedicated towards entrepreneurship. The goal of this Entrepreneurship & Innovation (E&I) track is to teach committed graduate students how to launch and develop emerging technology companies. Additionally, it aims to build a select lifetime cohort of collaborating entrepreneurial MBA classmates.

The E&I track is said to be more demanding than the regular MBA tracks. Oddly there are only a few required courses that distinguish the E&I track from the regular program: The required course "Introduction to Technological Entrepreneurship". This Introductory course outlines all entrepreneurship education and practice offerings at MIT. Heads of all relevant centers and services meet with the group, as well as several local entrepreneurs and venture capitalists. Additionally, the E&I students go on a one-week study trip to Silicon Valley, arranged by the Martin Trust Center. During this trip the group meets with high-tech startups in the life sciences, medical technology, and

software and information technology sectors. The rest of the semesters, the students have to complete several subjects from a list of entrepreneurial electives (such as E-Lab, G-Lab and I-Teams, which have been described previously). The last requirement for the E&I track is that students participate in at least one MIT $100K business plan team.

4.4. EXPERIENCES OF FOUNDERS FROM MIT

With the results of the interviews and document study regarding the offerings at MIT, a list was compiled of university offerings along with the purposes they are suggested to serve. This list of offerings was used as a guide during the interview with founders who studied at MIT. During the six structured interviews, the founders were asked questions about their company in general, their decision to become an entrepreneur and the origin of the founding team (if there were more than one founder). Finally each university offering was presented and the founders were asked whether they have had experience with offering. If they had experience with the offering they were asked to explain how the offering helped them as an entrepreneur, or how it helped their company. Additionally, founders were asked if there were any university offerings related to entrepreneurship that were not discussed, to ensure no offering was missed. Five of the six interviews were conducted face to face at the company site or in an MIT meeting room. One interview was conducted over Skype, as the founder was out of state. Others came up with their idea in a less traceable way, by discussing with co-founders or other people, or sometimes it happened "*just like that*". Table 4: Interviewed Entrepreneurs at MIT shows some general data regarding the founder interviews.

The six founders were selected based on two criteria: they were currently running a company and they had attended any MIT school in the past five years. The interviewees were approached by asking MIT faculty to suggest suitable candidates. An alternative approach to identify suitable candidates was by studying websites of business plan competitions in the Boston area. These business plan competitions, such as the MassChallenge and MIT $100k Competition, list participating startups on their websites. To assert whether the founder(s) actually attended MIT, LinkedIn was used. This cold calling approach proved less effective than direct introduction by MIT faculty. Only two out of ten 'cold-called' candidates responded to the interview invitation. As opposed to four positive responses out of four approached candidates when MIT faculty made a first introduction. To ensure that sufficient data was collected, the number of interviews was not predetermined. The author kept conducting interviews until no more new opinions and concepts were identified.

In this section, first some general results from the founder interviews will be discussed. Then each university offering will be presented along with the evaluation and experiences from the founders who attended the offerings. Finally, the results will be summarized in a schematic overview depicting the MIT offerings along with their evaluation.

4.4.1. General Results

Entrepreneurship is an important criterion for students to select MIT over other universities. Almost all of the interviewed founders knew they wanted to start a company at some point, all of them had some preexisting interest towards entrepreneurship, and they consciously choose to attend MIT because of it. As Taylor Matthews explains: "*I decided that the right time is not while I have a job, it's while I'm in school. I came to MIT specifically because it has a great reputation for entrepreneurship,*

and that's what I want to focus my time on while I was at the school." Tyler Spalding confirmed this (when asked why he applied for MIT): *"In order to become an entrepreneur was the primary rationale. At that instance I only knew engineering/PHD students, so I did not really have a good network. To get involved in a startup that I really wanted to get involved in, and get a global experience, I really wanted to go to business school. I specifically chose MIT over everyone else because the brand was really strong. It had a really strong undergraduate and graduate engineering program. As well as a strong focus on technology entrepreneurship."*

In general, the entrepreneurs came in touch with some form of entrepreneurship before they attended MIT. Some had worked in a small startup before; others had tried to launch a business earlier. At some point they decide that they need to meet other likeminded people, and that they need a break from their regular working life in order to start their own business. That is when they decide to pursue a graduate study. They reported to have chosen MIT because it has a strong "brand" and a good reputation as being "entrepreneurial". Only one entrepreneur, Blade Kotelly, did not come to MIT with the sole purpose to start a business. He was working as a lecturer at MIT, and was persuaded to follow a graduate program at the institute. He decided to become an entrepreneur during his graduate study period.

None of the founders came to MIT with a preexisting business idea. They developed their idea during or right after their time at MIT. The source of the idea varies. Two of the six entrepreneurs created their idea with their founding team during coursework. For example, Rene Reinsberg, the founder of Locu, developed his idea during the course 'Linked Data Ventures', which is taught by Sir Tim Berners-Lee (who is credited as the inventor of the internet). During this course the students were challenged to come up with ideas for the commercialization of linked data and semantic web technologies. They build a business out of technologies to efficiently digitize real world content through a novel combination of document analysis, machine learning, and online human computation workflows. Later on he followed another course with the same team to further develop their business idea.

Table 4: Interviewed Entrepreneurs at MIT

Name	Company	First venture	Founding date	Study	Graduated	Size of team	Employees	Website
Taylor Matthews	AppStori	No	jan-12	MBA	jun-13	2	6	http://appstori.com
Blade Kotelly	StoryTellingMachines	Yes	mrt-11	System Design & Mgmt.	jun-11	1	3	http://www.storytellingmachines.com
Brad Rosen	Drync	No	jan-06	MBA	jun-06	3	n.a.	http://www.drync.com
Karan Singh	Ginger.io	Yes	nov-10	MBA (E&I)	jun-11	2	9	http://ginger.io
Rene Reinsberg	Locu	No	nov-10	MBA (E&I)	jun-11	4	12	http://locu.com
Tyler Spalding	StyleSeek	Yes	mrt-11	MBA	jun-11	2	7	http://www.styleseek.com

Karan Singh is the co-founder of Ginger.io, a company that builds a check engine for someone's health, by taking mobile phone sensory data and turn it into insights about their health. His co-founder was working on some of the technology behind Ginger.io for his PhD research at the MIT Media Lab. Karan talked about his aspirations of becoming an entrepreneur to another

entrepreneurial student, whom introduced the two co-founders to each other, and after a while they decided to take the PhD research and turn it into a company. Others came up with their idea in a less traceable way, by discussing with co-founders or other people, or sometimes it happened "*just like that*".

Out of the five founders with co-founders, three met their co-founder at MIT. Generally, their co-founders are college friends, which they met in class or during extra-curricular activities on or around campus. At first, they decide to take an entrepreneurship class together to see if they can actually work together professionally. The other two founders met their cofounders outside of MIT.

4.4.2. MIT Offerings

In this section each offering as identified in section 4.3 is discussed in relation to the experiences of the founders (and only if founders had any experience with the offering).

The Martin Trust Center for MIT Entrepreneurship

The Martin Trust Center is, according to faculty, the central hub of all entrepreneurship related activities at MIT. This suggests that every entrepreneur at MIT must have encountered the center. All entrepreneurs that were interviewed indeed knew about the existence of the center. Out of the six entrepreneurs, five indicated to have attended the Martin Trust Center at some point. The one entrepreneur that did not attend the center indicated he felt that the offerings from the Trust Center, especially the courses, were mainly geared towards younger, less experienced entrepreneurs. At 38, he was indeed a bit older than most graduate students, and he already had been actively involved in a bunch of startups.

The entrepreneurs that did have experience with the Trust Center identified the following benefits:

- **Meeting place:** The main benefit the Trust Center provides is that it is a visible place to go if you want to be an entrepreneur and meet other likeminded people. "*It is good to have a place where people could go and know they can find an answer. There are a lot of student initiatives that are great but if you start a company you just have to go and do it. You need a place where you can find the people to work with, that is what the entrepreneurship center provides."* The Trust Center is seen as a place to hang out, to talk about entrepreneurship, and when the time is right, start to work on your own startup.

- **Office facilities:** The basic office facilities, such as a desk space, a conference room, and being able to take conference calls, proved to be the most helpful offering for the student entrepreneurs. They could not yet afford their own office space, and working from a small dorm room or apartment is not ideal. As one entrepreneur explains: "*It has been helpful to have this place where you can just use basic office infrastructure, getting a conference call, printing stuff. You don't think of it, but it is one of the most important things to actually be able to run a business, or to pretend to be a real business*."

- **Sharing space with others**: The entrepreneurs also praise the fact that there are other entrepreneurs around them, working from the same location. "*I think it is a good place to work. There is plenty of space, some is open, and some is closed. It is also great to be able to*

talk to the other folks that are around you working on their own projects." Another entrepreneur corroborated this: "*Really being able to bounce ideas of each other, share thoughts and resources etc. I wanted to meet real entrepreneurs, and the e-center filtered out the real entrepreneur from the people who were just interested in entrepreneurship."*

- **Mentoring**: Another important benefit identified by the entrepreneurs is the mentoring that the Trust Center offers. The kind of mentoring that the entrepreneurs praised was not a formal mentorship between a designated mentor and an entrepreneur, but consisted of informal advice by experienced people that make themselves available for the students. These mentors are the entrepreneurs in residence and the director of the Center itself, Bill Aulet. Simply discussing their ideas and problems with these people proved to be helpful. They help the entrepreneurs to connect to the right people and find the right resources both inside and outside of the MIT community.

Courses

Another entrepreneurship offering that most of the interviewed entrepreneurs had experience with were courses focused on entrepreneurship. The amount of courses they took differed. Unsurprisingly, the entrepreneurs that followed the Entrepreneurship & Innovation track followed most entrepreneurship related courses. Others took one, two, or three courses with an entrepreneurial theme.

- **Business Plan Generation:** As discussed in the previous section, there is a wide array of courses at MIT that focus on the creation of real companies and/or business plans. Some focus on students' own ideas (e.g. New Enterprises), others around MIT research (e.g. I-Teams). All of these courses require students to generate (parts of) a business plan. The interviewees that followed such courses indicated that it helps them to get a better understanding of what things to consider when starting a business, other than just the product itself.

  In addition, they credit going through the whole process of setting up a business as helpful. Some quotes: *"I-teams and E-lab etc. are all about taking an idea or the core of a product and building it out into a business. And I think that that is valuable. Just seeing that process, and understanding how other people have gone through that process is valuable."* Another entrepreneur shared the same opinion: *"It opened up a lot of valuable connections, and they really gave me insights in what they were looking for [in entrepreneurs] Going through the experience of talking to the customers itself was a valuable exercise. To be actually doing those things are really helpful. The real life experience you get with this course is really helpful."*

  Another reported benefit of the business-plan courses is that it offers a change to test-drive the team in a realistic simulation of what it would be like to run an actual business together. It allows the founders to measure whether the team members are aligned in terms of commitment and whether the individual members sufficiently compliment each other. Only one entrepreneur indicated that his current company grew out of a business plan competitions. Others were working on other ideas during the courses, which they eventually

abandoned. Sometimes, these abandoned ideas still grew out to be highly successful companies: "*it was e-lab. I started taking it but ended up auditing it because I realized that it was super basic, it teaches you how to write a business plan. It is cool, the way the course is organized: you come up with an idea and pitch it to the group. I found a professor who did research in RFID and set up a team. But when I realized the course was not for me I ended up putting another team member in charge. He took the company to the 100k competition, he won it, he raised 3 million dollar in venture financing and now he has a highly profitable company."*

- **Entrepreneurial Skill:** Next to developing business plans, MIT offers courses that focus on certain entrepreneurial skill, like sales, marketing, and finance. The entrepreneurs followed such courses with a specific goal to develop certain skills (as opposed to simply following courses to meet demands for the curriculum). The overall opinion was that these courses provided a basic understanding of the important concepts. However, they are too basic to really develop the actual skills. Some opinions from entrepreneurs: *"The courses were moderately helpful. I did not really learn real skills from them, but they gave me the forced idea of the things that are important to pay attention to. They did not teach me how to do sales or how to develop a marketing plan or a business plan, but it highlights the contents it should have. It teaches you the language, the terms you need to know. What is market segmentation, cost of customer acquisition etc. Knowing that those things are important is the real value of these courses."* Another entrepreneur added to that: *"Learning all the things that matter was most valuable to me. Then you see it and understand. Still you do not learn to be GOOD at these things, it still gave me the insight that I need to be confident with it."*

- **Industry Specifics:** Some courses at MIT are not specifically tailored towards entrepreneurship, but are still considered highly relevant for entrepreneurs. These courses focus on specific industries and teach entrepreneurs how the industry works. They identify important issues within specific industries. Who are the big players? What are successful business models? What strategies are being used? One of such courses that the interviewed entrepreneurs praised was a course on the software industry, called "*The Business of Software and Digital Platforms*". *"I think a lot of things in Software Entrepreneurship are different than in other areas. There is a class that Prof. Cusumano teaches, I took it. It was a great class. If you know what you want to do and you can take a class that addresses these things specifically, I think that is great"*

Business Plan Competitions

All entrepreneurs have participated in a business plan competition at some point. Four of the six entrepreneurs participated in MIT's 100k Competition, the other two participated in an external business plan competitions such as MassChallenge. The entrepreneurs highlighted several ways in which a business plan competition helped them or their company.

- **JFDI:** A business plan competition follows a tight schedule with strict deadlines. Participants have to work hard in order to be able to stay in the race. This proved to be one of the important benefits of such a competition. One entrepreneur explains: *"The main way is that they encourage you to actually think through your business and put it on paper, and start*

doing something. That is actually, more broadly, what MIT is really good at. We've been told countless time: 'JFDI' [an abbreviation for Just Freakin' Do It]. These business plan competitions, especially the 100k, take you from elevator pitch to accelerate and into the 100k; I think that's really valuable to get people to take action."

- **Publicity:** Participating in (and especially winning) a business plan competition brings reasonable publicity to the startup. Regional newspapers, broadcasters, and websites cover the competition, and names and pitches of participators and finalists are often published in press releases.

- **Mentorship & Feedback:** During the business plan competitions, participating teams receive intensive mentorship. More importantly, they are given sharp feedback during several rounds of presentations in front of a jury. This feedback proved to be helpful. Entrepreneurs indicated it "*helps you shake up your business model, change it around, it let's you meet mentors that critique you but most of all it helps you focus. In the beginning you want to solve too much problems."*

- **Networking:** The business plan competitions attract interests from local entrepreneurs and investors. Therefore, the business plan competitions are also good places to grow their network and meet important people in the entrepreneurship community.

Student Clubs

At MIT there are a bunch of student-run clubs focusing on entrepreneurship. These clubs host talks and discussions regarding (aspects of) entrepreneurship and provide a place for aspiring entrepreneurs to go. However, only two of the interviewed entrepreneurs indicated to have participated in any of those clubs. As a benefit they indicated it helps you in such a way that you meet other people interested in entrepreneurship there.

Intangible Offerings

Aside from the 'physical' offerings, the entrepreneurs also identified several important offerings that are not so easy to observe. These intangible offerings proved to be (at the least) as beneficial for the entrepreneurs' success than the tangible offerings discussed previously. Among the intangible offerings, the entrepreneurs identified several beneficial things, such as:

- **Role Models:** As discussed in the previous section, MIT has a long history with entrepreneurship, and MIT alumni have created a high number of successful companies in the past. These previous entrepreneurs serve as role models for current students. It gives them the confidence that it is possible to create a successful company as an MIT student. MIT celebrates these entrepreneurial role models. The entrepreneurs are regularly invited back to give talks or to serve as a mentor. Additionally, it is not uncommon for entrepreneurial alumni to donate significant amounts of money towards the stimulation of entrepreneurship at MIT, like Gururaj Deshpande with the Deshpande Center and Martin Trust with the Trust Center.

- **MIT Faculty:** Another helpful influence identified by the entrepreneurs is the "*network of teachers*". One entrepreneur explains: "*I stayed in touch with many of my former teachers, and talked to them about investment structure, company structure etc. My personal coach at Sloan was a professor, I still meet with her every week, and I did since leaving Sloan in 2007. It became more like a friendship. And I stayed in touch with Ed Roberts and others. They introduced me to so many people that helped me, and in return they sometimes ask me to come and speak in their classes.* "

- **The MIT Brand:** MIT is a university with worldwide publicity, and is one of the highest-ranking universities in the world. The entrepreneurs indicated this helps students coming out of MIT tremendously, as people *"all think you are a genius. It lends instant credibility to things, even if it is undeserved".* Additionally, the MBA title from MIT reportedly helps to raise venture capital in the Boston area.

Outside of MIT

Around MIT a vibrant entrepreneurship community developed, consisting of venture capitalists, existing entrepreneurs, incubators, accelerators, regional business plan competitions, and other universities. These external offerings also proved helpful towards the success of the entrepreneurs. Even though external offerings also have an influence of the effectiveness of the fostering of entrepreneurship at universities, it is out of the scope of this research project and is therefore not considered in the results.

4.5. ENTREPRENEURSHIP AND CURRENT STUDENTS

Unfortunately, the survey results from MIT students are not available, since the survey could not be conducted at MIT. In order to ensure optimal comparability between student populations at the three universities, only students with an Information and/or Computer Science major were suitable for participation. However, faculty from the School of Electrical Engineering and Computer Sciences denied access to its student population during the period the research was conducted at MIT.

An earlier study comparing German business school students with business schools from MIT found that the MIT students are significantly more inclined towards entrepreneurship. Furthermore, they also seemed more ambitious than the German students. The authors found that the main difference is that the MIT students perceived the environment for entrepreneurship, which consisted of the university offerings, government policies, financing options etc. as more favorable than the German students. Especially the university offerings were evaluated as an important factor (Franke & Lüthje, 2004). It is assumed that the same differences would have been found in the present research.

4.6. OVERVIEW OF MIT OFFERINGS

This section summarizes the offerings of MIT, and the evaluations of these offerings by the founders. Table 5 presents all identified MIT offerings, ordered in three categories. Each offering is given a rating based on the evaluations from the interviewed entrepreneurs. These rankings range from two plus signs, implying the offering was evaluated as an important contribution to startup success. One plus sign indicates an offering was evaluated as helpful, albeit less crucial than other offerings. A 0 indicates that the founders did not have any experience with the offerings. A minus means the

offerings did not contribute to startup success. Additionally, an exemplary quote is provided, from one of the startup interviews, in order to provide an example of how the offering helped the startup. For some offerings no suitable quote is available, these are indicated with N/A (not available).

Table 5: Overview of MIT offerings

		Evaluation	Exemplary interview quote
Center for Entrepreneurship			
	Meeting place	++	*It is good to have a place where people could go and know they can find an answer. There are a lot of student initiatives that are great but if you start a company you just have to go and do it. You need a place where you can find the people to work with, that is what the entrepreneurship center provides*
	Mentoring	+	N/A
	Coordination	0	N/A
	Tech Transfer	0	N/A
Education			
	Business Plan Courses	++	*It opened up a lot of valuable connections, and they really gave me insights in what they were looking for [in entrepreneurs] Going through the experience of talking to the customers itself was a valuable exercise. To be actually doing those things are really helpful. The real life experience you get with this course is really helpful*
	Entrepreneurial Skill Courses	-	*The courses were moderately helpful. I did not really learn real skills from them, but they gave me the forced idea of the things that are important to pay attention to. They did not teach me how to do sales or how to develop a marketing plan or a business plan, but it highlights the contents it should have. It teaches you the language, the terms you need to know. What is market segmentation, cost of customer acquisition etc. Knowing that those things are important is the real value of these courses.*
	Industry specific	+	*I think a lot of things in Software Entrepreneurship are different than in other areas. There is a class that Prof. Cusumano teaches, I took it. It was a great class. If you know what you want to do and you can take a class that addresses these things specifically, I think that is great*
Incubator Service			
	Common Working Space	++	*Really being able to bounce ideas of each other, share thoughts and resources etc. I wanted to meet real entrepreneurs, and the e-center filtered out the real entrepreneur from the people who were just interested in entrepreneurship*
	Office Space	+	*It has been helpful to have this place where you can just use basic office infrastructure, getting a conference call, printing stuff. You don't think of it, but it is one of the most important things to actually be able to run a business, or to pretend to be a real business.*
	Mentoring	+	*It helps you shake up your business model, change it around, it let's you meet mentors that critique you but most of all it helps you focus. In the beginning you want to solve too much problems*
	Networking	++	N/A
	Business Plan Competition	+	*These business plan competitions, especially the 100k, take you from elevator pitch to accelerate and into the 100k; I think that's really valuable to get people to take action*
	Funding	0	N/A
University Culture			
	Supporting Faculty	++	*I stayed in touch with many of my former teachers, and talked to them about investment structure, company structure etc. My personal coach at Sloan was a professor, I still meet with her every week, and I did since leaving Sloan in 2007. It became more like a friendship. And I stayed in touch with Ed Roberts and others. They introduced me to so many people that helped me, and in return they sometimes ask me to come and speak in their classes*
	Role Models	+	N/A

++ = Important contribution to startup success
+ = Helpful contribution
0 = None of the entrepreneurs had experience with the offering
- = The offering did not significantly benefit the startups

5. THE INTERNATIONAL INSTITUTE OF INFORMATION TECHNOLOGY

5.1. INTRODUCTION

In the sixties of the previous century, India instituted the creation of several 'Indian Institutes of Technologies' (IITs) in collaboration with a consortium of nine US research universities, including MIT. These IITs grew out to be highly successful, selective, and prestigious technical universities. Based on the success of the IITs and India's incredible demand for highly educated computer engineers, during the nineties several dedicated Indian Institutes for Information Technology (IIITs) emerged. The Indian Institute for Information Technology in Hyderabad launched in 1998 as the first IIIT. Later in 2005 it was renamed to International Institute for Information Technology Hyderabad (IIIT-H).

Hyderabad is the capital of Andhra Pradesh, and with over 6.8 million residents it is the fourth most populous city in India. Hyderabad, witch is often nicknamed 'Cyberabad', is one of India's major IT hubs. It houses the Indian headquarters of IT giants such as Microsoft, Google, Accenture, and IBM. Infosys and WIPRO, India's two largest IT services providers, also have large campuses in the city. These employers account for a large percentage of jobs for IIIT graduates in the region.

The IIIT-H is a university that focuses on research and education in fields related to Computer Science and Information Technology. Its mission is to "*achieve excellence in research and introduce relevant programs that maximize the impact on industry & society*". It focuses on research with practical applications. It offers Bachelor, Master and PhD degrees in several areas of information technology. During its relatively short existence, IIIT-H became one of the highest ranked engineering colleges in India. Next to high-class research and education, IIIT-H also has a goal to actively prepare students for a career as an entrepreneur. IIIT-H is not organized around departments or schools. Instead, it is divided into research centers and labs, to facilitate collaborative research. The academic programs fall under direct supervision of the institute as a whole, and not under any individual research center. IIIT-H has around 1400 students as of 2011.

5.2. DATA GATHERING

The case study at IIIT-H was conducted during February and March of 2012. The case study was performed similarly to the case study at MIT, as described in section 4.2. Documents, such as the university website, were used to gather information regarding the different offerings. Additionally, three faculty interviews were conducted. Details of these interviews are presented in Table 6.

Table 6: Interviewed Faculty at IIIT-H

Name	Role
Kavita Vemuri	Founder of Center for Innovation & Entrepreneurship
Nirmala Govindan	Managing Director Center for Innovation & Entrepreneurship
Ramesh Logonathan	Director Progress Hyderabad & Advisor within Center for innovation & Entrepreneurship

The document study and interviews lead to an overview of the entrepreneurship offerings at IIIT-H. These offerings were used as input for the founder-interviews, with eight founders that were either IIIT-H graduates, or were tenants of the IIIT-H incubator program, to get an idea of how the entrepreneurship offerings contributed to their success. These interview results will be discussed in section 5.4.

5.3. ENTREPRENEURSHIP AT IIIT-H

With 1400 students, IIIT-H is a small institute compared to the two other case universities, MIT and Utrecht University. Additionally, having been established in 1998, it is a relatively young institute. Therefore, the small number of entrepreneurship related offerings are relatively young as well. This does not imply that the entrepreneurship offerings at IIIT-H are any less effective than the offerings at other institutes. At IIIT-H, the number of students pursuing an entrepreneurial career is steadily growing and the number of startups originating from the institute increases accordingly. In this section, the entrepreneurship offerings, along with their purposes, will be presented. In the following section these offerings will be evaluated with input from the founder interviews.

5.3.1. The Center For Innovation and Entrepreneurship

IIIT-H has always had a positive attitude towards innovation and entrepreneurship. Its faculty consists of researchers with close connections to industry, and external mentors were always available to meet with prospective entrepreneurs. However, the number of students pursuing an entrepreneurial career has traditionally been low. The big IT companies surrounding the IIIT-H campus are offering high paying jobs for graduated IIIT students. This was the reason that in March of 2008, the institute initiated a dedicated center to more actively foster entrepreneurship among its students, alumni, and faculty: the Center for Innovation and Entrepreneurship (CIE).

The institute did not have any experience as how to set up an incubator, so they approached Kavita Vemuri, a woman with a background in industry, who had some previous experience setting up incubators in other cities, such as Chennai. The CIE was not organized after any existing models, but services and facilities were added along the way, as they were needed by the startups.

The CIE is an incubator specifically focusing on product companies in the software industries. Several service-oriented companies have been admitted as well, but the incubator actively tries to persuade these companies to develop products as well. It operates with a mission "*to convince scientists, academicians and students that the strength of research or success of a technology or concept is its impact on society measured by its widespread acceptance and commercial viability*". Its primary focus is on incubating entrepreneurial ventures of IIIT students, alumni, and faculty. However, occasionally outside entrepreneurs are admitted into the incubator. At the time of data gathering,

there were around 10 startups in the incubator. Startups generally spent three years in the incubator, although this is not a strict enforced rule. If a startup is past his third year and still shows promise, it is not a problem if it wants to stay a bit longer. The CIE aims to "*encourage entrepreneurship in different stages*", and serves as a guide to entrepreneurs, to help them succeed in the "*big bad world outside*". The CIE used to be owned completely by the institute. However, a recent university act prohibited Indian universities from investing in commercial ventures. Therefore, the ownership has recently been transferred to a foundation: the Banyan Intellectual Initiative. The incubator services are free to use, however the institute takes an equity stake of 2 percent in the incubated companies.

The CIE offers the following:

- **Meeting Place:** The CIE is the center at the university that deals with all aspects of entrepreneurship. Therefore, it is a visible place to go for students interested in entrepreneurship. Prospective entrepreneurs can visit the center at any time and meet other entrepreneurs and talk to mentors from the CIE.

- **Physical Office Space and Infrastructure:** Entrepreneurs who participate in the incubator program get assigned designated office space inside the CIE. The facilities range from desk space, Internet connection, meeting rooms, and a small kitchen. New startups mostly start out in a shared room, working next to other young startups. Eventually, as the companies grow, there are possibilities to move to a separate office.

- **Mentoring:** The CIE maintains a network of local entrepreneurs, venture capitalists and business leaders, who free up time to meet with the entrepreneurs. Additionally, the CIE staff makes themselves available for the entrepreneurs. There is no structured approach or program that the incubatees follow, so the type and amount of mentoring are decided on an individual basis. Generally, the students lack essential business knowledge. As Nirmala Govindan explains: "*Our role is to hold their hand, we guide students through the reality of the business environment. If a student comes to us and has an idea, which he wants to commercialize, we tell them: look, first go see what the competition is, how would you earn revenue? How are you going to get customers? Are there other places where you could apply your idea? Etc."* A typical mentoring approach to help entrepreneurs develop their product works as follows: When the entrepreneurs first come in, they are asked to analyze and validate their idea. When they have developed a good business plan, the second step is to have them create a prototype to ensure the idea is technically feasible and the entrepreneur is really as committed as he thinks he is. When the prototype reached certain maturity, the CIE reaches out to investors and ask them to provide feedback on the prototype, on both technical and business sides. The CIE also tries to help in finding the first customers through their extensive network of Indian businesses.

- **Technology Transfer:** The CIE not only helps startups by providing office space and mentoring services. It also facilitates the transfer of IIIT-H technology for commercialization. Up until now, technology transfer to an incubated startup occurred on two occasions. In both cases, a Master or PhD student performed research in a specific area, and saw commercial opportunities. They launched a start-up in the CIE, in cooperation with their professor who

acted as faculty co-founder. The CIE works out the licensing or transferring of technology between the institute and the startup. This usually consists of the university taking a (higher) equity stake in the startup of around 7%.

- **Seed Funding & Networking:** The Indian government provides a fund to stimulate entrepreneurship, estimated to around one million USD. The government provides this fund to IIIT-H, and IIIT-H uses it to invest in promising startups, in the form of a seed funding. Later on, if the company has grown to a point where it can receive investments from normal investors or venture capitalist, CIE advisors will support them by introducing the entrepreneurs to local investors. Mr. Logonathan, one of the advisors of the CIE, explains this process: "*There is an investment arm in IIIT called Banyan Investment Initiative (BII). It is a society fully owned by IIIT. I'm on the board, and several faculty members are on the board. The Banyan Investment Initiative makes the investment decisions. And CIE kind of falls under the BII. CIE is part of BII. So that is the initial funding. Then they come to that certain point where they are making some revenue. Then they can go to normal investors or VCs. CIE helps with that, we know a lot of investors. We can very easily get time from investors. In Hyderabad alone, I know two angel networks. I am part of one of them.*" Logonathan does not think it is hard for students to find external investors: "*If you have a good story, reaching an investor is not a problem. Getting a good story can be a problem, but finding investors is not.*"

- **Additional events:** Besides incubator services, the CIE organizes several events open for the whole entrepreneurship community in Hyderabad. They organized an accelerator program called the "HydCubator", which ran irregularly between 2008 and 2011. During the program, entrepreneurs received intense mentoring and initial seed funding. Another event is the StartupSaturday. Hosted every other Saturday in a conference venue in Hyderabad, the StartupSaturday invites entrepreneurs to pitch their ideas and talk about their business in front of an audience consisting of investors and other entrepreneurs.

5.3.2. Education

IIIT-H does not offer a single course related to entrepreneurship. Ms. Vemuri, the founder of the CIE explained that she does not see courses as a suitable way to teach entrepreneurship. She much rather advises teams on an individual basis than teaching generic entrepreneurship-concepts to a whole class. Over the years there have been some short seminars hosted by guest-lecturers. Unfortunately, IIIT-H was not able to provide data on these past educational offerings. The only current course that has some relation to entrepreneurship is a class taught by Ms. Vemuri: the Product Design and Engineering class. However, this course does not market itself as containing entrepreneurial elements.

5.4. EXPERIENCES OF FOUNDERS FROM IIIT

Similarly to the case study at MIT, described in chapter 4, the input from the document study and faculty interviews lead to a list of entrepreneurship related offerings at IIIT-H. This list was then presented to founders of startups that studied at IIIT-H. As can be observed in the previous section, the number of separate offerings at IIIT-H is relatively low, therefore the interviews mainly focused

on how the incubator helped the entrepreneurs. The number of founders that actually studied at IIIT-H was low, so founders that did not study at IIIT-H but joined the incubator in a later stage were also included. In total eight interviews have been performed between February 12th and March 1st. During the eight structured interviews, the founders were asked questions about their company in general, their decision to become an entrepreneur and the origin of the founding team (if there were more than one founder). Finally each university offering was presented and the founders were asked whether they have had experience with offering. If they had experience with the offering they were asked to explain how the offering helped them as an entrepreneur, or how it helped their company. Additionally, founders were asked if there were any university offerings related to entrepreneurship that were not discussed, to ensure no offering was missed. Table 7 provides an overview of the interviewed entrepreneurs.

Table 7: Interviewed Entrepreneurs at IIIT-H

Name	Company	First venture	Founding date	Study	Graduated	Size of team	Employees	Website
Abhilash Inumella	SmartLantern	No	jun-11	Computer Science (BS)	jun-12	3	0	http://smartlantern.com
Ravi Kiran	GoLive	Yes	mrt-08	MS IT	apr-05	3	6	http://www.golive.co.in
Prasad Pingali	SETU Software	Yes	dec-08	PhD		2	22	http://www.setusoftware.com
Chaitanya Sagar	PercepticeAnalytics	Yes	may-07	MBA (not IIIT)	apr-05	1	7	http://www.perceptive-analytics.com
Gopi Krishna	Wignite	Yes	may-10	Mtech (not IIIT)	apr-97	2	1	http://www.wignite.com
Tarun Jain	Crypsis	No	mrt-09	MS Computer Science	apr-08	2	17	http://crypsis.net
Mamtha Banarjee	Investment Yogi	Yes	mrt-07	Computer Science (not IIIT)	jun-93	2	5	http://investmentyogi.com
Raghavendra Veera	Akshar Speech	Yes	mrt-10	MS Speech Processing	apr-09	2	4	http://www.aksharspeech.com

5.4.1. General Results

At the time of data gathering, all interviewed entrepreneurs were based out of the CIE incubator. Out of the eight interviewed entrepreneurs, five had attended IIIT-H as a student. The level of study differed: one student attended IIIT-H as a PhD student. One entrepreneur just finished his Bachelor Computer Science. Three of the entrepreneurs obtained a Masters degree at the institute. The other four entrepreneurs that were based out of the CIE joined at a later stage, and completed their education at different institutes.

Six out of the eight founding teams consist of two founders. Only one entrepreneur did not start his company with another founder, although he indicated that he is still actively looking for a co-founder. The two remaining teams consist of three founders. The type of co-founders varies, from college-friends and classmates to external friends. Both companies that have been founded based on university research (Akshar Speech and SETU Software) have a faculty-member as co-founder.

Even though all the startups are still housed inside the CIE incubator, their size varies greatly, from companies with no or a single employee (not considering founders) to companies with 17 (Crypsis) and 22 employees (SETU). On average, the startups in the CIE have 7 full time employees. All startups at the CIE are relatively young. The oldest two startups launched in the beginning of 2007, before the CIE existed, and moved in later. The others started between 2008 and 2011.

None of the five entrepreneurs that had attended IIIT-H as a student considered entrepreneurship a factor for attending the university. Additionally, none of the students knew they wanted to become an entrepreneur before attending the institute. Students were drawn to the university because of its reputation as one of the top university in the country in the field of IT. On the question why the entrepreneurs decided to start their own business, answers varied. One entrepreneur felt inspired by his classmates and successful US startups he followed on the Internet. Others just realized their idea had real potential and decided to "*just give it a try*".

One important aspect most entrepreneurs highlighted as an important influence was not so much an `offering' but more an `attitude' of the university: the interviewees indicate that university faculty and staff were always supportive towards entrepreneurial ideas, even before the CIE was officially established. This has been an important influence for most to actually consider becoming an entrepreneur. Overall, the interviewed entrepreneurs indicated that the university offered several crucial offerings that helped them to be more successful than otherwise possible. However, none of the entrepreneurs believed their company would not have existed if they did not attend the university offerings, although the whole process of starting and growing a company would be much harder.

5.4.2. IIIT-H Offerings

As discussed in section 5.1, entrepreneurial offerings at IIIT-H are young, and there are relatively few distinct offerings. Therefore, the founder-interviews mainly focused on their experience with the CIE incubator and the intangible offerings from the institute, such as association with the university brand, the physical location, and the benefits of being near research centers and young talent.

The Center for Innovation and Entrepreneurship

The CIE is the central place for all entrepreneurship-related activities at IIIT-H. All interviewed entrepreneurs use their incubation facility. The services and support offered by the CIE can be divided into several categories. The categories, as identified by the entrepreneurs, are presented, along with their experiences and evaluations.

- **Physical Office Space:** The basic office infrastructure provided by the CIE, like desks, chairs, and Internet access, where unanimously rated as one of the most important offerings of the incubator, especially for young startups that do not make a significant revenue. The entrepreneurs that were not former IIIT-H alumni joined the incubator specifically for this reason. One unexpected aspect of the office infrastructure, at least from a western perspective, was that the startups also evaluated the reliable electrical power supply as an important offering. In Indian cities it is not unusual that power outages occur. For Internet based startups, with clients across the nation and all over the world, this poses a mission-critical risk. As one entrepreneur, who first started his company outside of the CIE, explains: "*The situation might be different here than where you come from in the Netherlands. One of the issues that we face is getting reasonable commercial space on a rental basis. There are serious power issues, especially during summer. You would have at least two to three hours of power cut. You cannot survive with that kind of situation. What can you do without power? IIIT-H shielded us from all of this. So we could focus on our work."* The entrepreneurs indicated that the office space is the single most important offering in the first phases of

starting the company. Older startups (two to three years old) indicate that office space becomes less crucial later on, as they start to earn enough revenue to potentially rent independent office space.

- **Sharing space with others:** Another advantage identified unanimously by all of the entrepreneurs is the sharing of office space with other startups. The companies work together. Depending on size, some larger startups have their own office within the CIE, while others, with fewer employees, share common working space. Either way, all startups are physically close to each other. The main benefits are that the entrepreneurs help motivate each other, and share knowledge between the startups: people share their contacts, or discuss how to solve common startup issues. "*We are very close with each other in terms of knowledge. We share things. For example HR practices; how do we hire employees or interns? On these things, we have good collaboration with the other startups*."

- **Mentoring:** In terms of mentoring, the entrepreneurs disagreed over how helpful it was. They evaluate informal mentoring by talking to CIE staff as helpful. Faculty and staff members, such as Nirmala Govindan, Kavita Vemuri and Ramesh Logonathan, make themselves available to the entrepreneurs, and provide a source of guidance if the entrepreneurs come and ask for it. However, the entrepreneurs highlighted the lack of any formal mentoring. The startups are not forced to discuss their progress on a regular interval, and are not often critiqued on the decisions they make. One of the entrepreneurs explains: *"We did have one or two meetings. We had some mentoring. Once in a while I reach out to Kavita and Nirmala, Ramesh and some others. In an informal matter, they always help us. Informally we receive a lot of support from them. But not in a formal matter."*

  Another aspect several of the interviewed entrepreneurs identified is the low involvement of external mentors. There are external mentors/advisors, and they do provide a great deal of support. However, their level of commitment is not as high as some of the entrepreneurs would like to see. One entrepreneur explains it as follows: "*I would definitely explore more ways to have deeper involvement of highly successful people in the incubation center. It is not that it is not been done today, but the level of involvement is very low. People do not feel sense of ownership. I feel we should explore different ways so that people become more motivated to come and spend more time with the startups. It is a very difficult challenge, for any incubator. If you have somebody who has been there, who has been successful, they are probably busy or already retired. It is hard to get their time."*

- **Networking:** The CIE actively tries to network the entrepreneurs to potential investors and customers. The CIE has successfully helped most of the entrepreneurs to come in touch with investors (although not every entrepreneur decided to take out an investment). However, entrepreneurs do not all benefit from networking with customers. Software solutions targeted at consumers or focusing on international markets do not benefit as much from local business connections.

- **Technology Transfer:** As discussed previously, two of the interviewed companies built their business around technology that emerged out of university research. Both of these

companies licensed the technology from the institute in order to exploit it commercially. The CIE facilitated this technology transfer. It acts as a broker between the institute and the startup, and takes care of all formalities. In both cases, the technology was licensed by providing the institute with an equity stake in the company. This way, the entrepreneur does not have to pay anything up front, but if the startup becomes successful, the institute benefits as well. Both entrepreneurs did not want to disclose how much equity stake the institute took up. However, during the faculty interviews it was made clear that the percentage is in the range of 7%.

- **Seed Funding:** The CIE also indicated that it provides seed funding for its incubatees. The seed funding is offered as a combination of both a direct loan and a percentage of equity. Not all entrepreneurs made use of this offering. Unfortunately, not everyone was able to (or did not want to) provide a reason on why they did or did not use the seed funding. One entrepreneur indicated that he did not want to take out a loan because of the risk. He was not sure whether he would be able to pay it back in time. Others, which did take seed funding from the university, took it "*to solve cash flow issues*". Although all entrepreneurs were positive about the fact that seed funding was available if they needed it, they did not indicate the funding as a crucial offering. It is interesting to note that both of the companies that relied on technology transfer also took out seed funding from the university.

Other university influences

- **Role Models:** Several of the interviewed entrepreneurs indicated that role models helped made them decide to become entrepreneurs themselves. Most of the role models they talked about were American success stories such as the founders of Google, Facebook, and Microsoft. However, some other role models were former classmates or alumni from IIIT-H, such as Prasad Pingali of SETU Software, one of the first companies to join the CIE incubator. The CIE provides opportunities for existing startups to present during university events. This is not only an effective way to gain publicity for the startups, but it also helps inspire other students to pursue an entrepreneurial career.

- **Research Lab Collaboration:** At the time of data gathering, the CIE started a new initiative called 'GameHub'. A specific initiative to stimulate entrepreneurship in the computer games domain. One of the interviewed companies is part of this GameHub. The GameHub is a first initiative in active collaboration with university research centers, such as the 'Center of Visual Information Processing'. The new initiative tries to bring together faculty, students, and entrepreneurs interested in game development. Other entrepreneurs have not yet experienced these kinds of initiatives, but welcome the opportunity to work together with researchers and students.

- **Being part of the university:** An often cited intangible and indirect 'offering' most entrepreneurs talked about was the fact that they could associate themselves with the university. Simply stating that they are incubated at IIIT-H provided credibility in negotiation with clients, partners, and investors. Additionally, being part of IIIT-H helped the entrepreneurs to hire IIIT-H students. Several entrepreneurs indicated that hiring talented students would not be as easy if they weren't incubated at IIIT-H. As one entrepreneur

explained: "*It also helps just to be inside the university environment. I hired a lot of IIIT students. This would not have been possible if we had been in a different setting. Even if we would have just been two kilometers away. I consider it a very helpful factor. I hear from other entrepreneurs outside of university environments that it is too hard to hire good people. We don't have that problem.*"

Education

The interviewed entrepreneurs indicated that they did not follow any education related to entrepreneurship, as IIIT-H does not offer it. When asked whether that was something they missed, most entrepreneurs indicated that it is not really that important. The personal interaction with experienced mentors was more helpful, as "*entrepreneurship is a dynamic process, which cannot be taught from a textbook*." However, several interviewees indicated that offering (general) courses in entrepreneurship could help to inspire more students to consider entrepreneurship as a career offering. One entrepreneur explained: *"My belief is that you can not really educate someone to become an entrepreneur. But there are always people who are already inclined to become an entrepreneur in the back of their mind. Then a course may be useful to them. Because this is a computer science institute, most students would not know anything about corporate law or accounting. These are not general entrepreneurship courses, but more entrepreneurship tools. But Computer Science students probably will not pick up these subjects. They probably won't ignite entrepreneurship. ."*

5.5. ENTREPRENEURSHIP AND CURRENT STUDENTS

The previous section focused on existing entrepreneurs and their experiences with entrepreneurship-related offerings at their institute. This section will look at how current students look at entrepreneurship and the offerings at their institute. What percentage of current students sees entrepreneurship as a career option? How do they evaluate university offerings related to entrepreneurship? The results presented in this section are based on a survey conducted at IIIT-H. The design and content of this survey is discussed in section 2.4.

Approximately 1000 current IIIT-H students were invited to participate in the survey by e-mail. 173 students started the survey. However, only 87 IIIT students fully completed their survey responses. This implies an approximate response rate of 8.7%. Of the 87 complete respondents, 80 (92%) indicated they were male and 7 (8%) indicated they were female. This is estimated to be in line with the gender distribution of the general population at the institute. 40.3 % of respondents indicated they were following an undergraduate/bachelor program. 54% of respondents followed a Graduate/Master program. 5.7% percent of respondents indicated they were PhD students. The age of respondents ranged from 18 to 35 years old, with an average of 22.75 (std. deviation 3.45). On average, respondents had been studying 5.18 years. However, with a minimum of 1 years and a maximum of 20 years, it is likely that some respondents included the years following primary and secondary education. All respondents indicated they followed a Computer Science program.

5.5.1. Career Intentions of IIIT-H students

Respondents were asked to indicate which career path they intended to pursue right after completion of their studies, and which career path they envisioned five years after completion. This

question is purely based on the respondents' own expectations. A graph summarizing the answers is presented in Figure 10. The respondents could choose amongst ten categories, such as "As employee in a small or medium-sized firm (1-249 employees)" or "As a freelancer". Several categories, including "As a freelancer", "No professional career" and "Do not know (yet)" represented zero or low percentages in both the "right after studies" category as well as the "5 years after studies" category. These have been combined and added to the "Others" category to improve readability.

The graph shows that right after studies, only 4,6% of respondents imagine themselves starting their own business. The majority of respondents (57.5 %) expect to join a large firm with 250 or more employees. The second most popular career path, representing 20.7% of respondents, is to join a small or medium-sized firm. Expectations are completely different when asked where they see themselves in five years after leaving the university. In five years, 37.9% expects to become an entrepreneur, and only 16.10% imagines he or she still works for a large company.

From these results can be concluded that only a few IIIT-H students are likely to start a business right after studies. Some of them might join a startup or other small to medium-sized firm, but the vast majority will join a big corporation. However, a significant amount of students expect that they will pursue an entrepreneurial career eventually. So there is a fair amount of interest in entrepreneurship among IIIT-H students, at least in the long term. These indirect founders, that expect to found a business later in their career, could also potentially become new incubatees at the CIE, as it is also open to alumni.

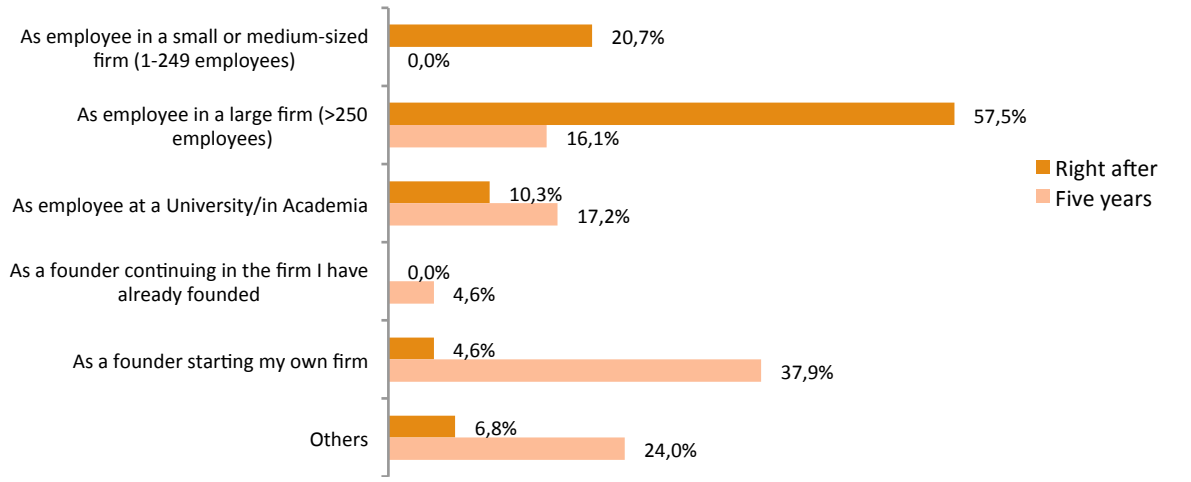

Figure 11: Chart representing career intentions of IIIT-H students

Another question in the survey asked how serious the respondent has been thinking about founding his or her own company. Respondents could choose between nine options, which are presented in Figure 11, along with the percentage of respondents that selected that option.

The respondents who chose the options "Repeatedly" to "I have already started with the realization" are considered 'intentional founders': they have not yet started a business, however they have repeated serious thoughts about it. Respondents that selected the option "I am already self-employed in my own founded firm" or "I have already founded more than one company, and am active in at least one of them" are considered 'active founders': they are already running a business. It is surprising that although only a minority of respondents eventually expects to become an

entrepreneur, 80.5% of respondents had at least sketchily thought about a business idea. IIIT-H students apparently do have many business ideas.

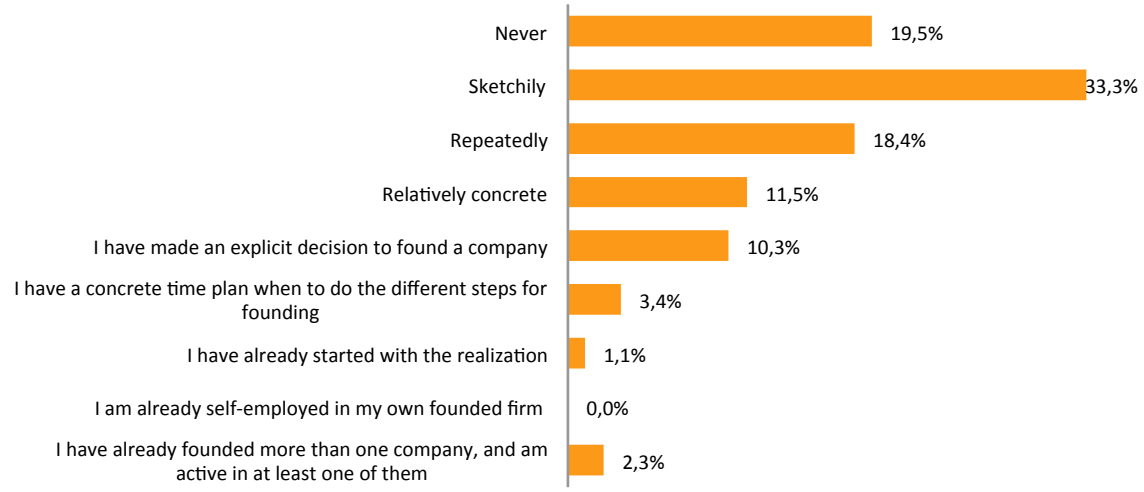

Figure 12: Founding intentions of IIIT-H students

Another question asked respondents to indicate their agreement with several statements regarding the attractiveness of becoming an entrepreneur. The question presented statements such as "*Being an entrepreneur implies more advantages than disadvantages to me*" and "*If I had the opportunity and resources, I would become an entrepreneur*", and asked the respondents agreement on a 7-point Likert scale. The results are presented in Table 8. A score of 4 represents a 'neutral' response, as it is right in the middle of "very unimportant" and "very important". Overall, respondents at IIIT-H have a clear tendency towards entrepreneurship. It is interesting to see that the respondents on average agree they would become an entrepreneur if they had the opportunity and resources, which implies that they currently do not think they have opportunity and resources.

Table 8: Attractiveness of entrepreneurship for IIIT-H students

	N	Mean	Std. Dev.	Mode
Being an entrepreneur implies more advantages than disadvantages to me.	87	4.64	1.752	4
A career as entrepreneur is attractive for me.	87	4.75	1.850	7
If I had the opportunity and resources, I would become an entrepreneur.	87	5.10	1.989	7
Being an entrepreneur would entail great satisfactions for me.	87	5.06	1.845	7
Overall Mean	87	4.89	1.679	N.A.

Overall, it can be concluded that entrepreneurship is definitely something that IIIT-H students think about. They are considerably favorable towards entrepreneurship. However, most students do not consider a career as entrepreneur right after graduation. Several faculty members explained this to be a cultural phenomenon: Indian students, in contrast to western students, allegedly receive more pressure by parents and spouses to choose a risk free job with a decent salary instead of the uncertainty and risk that is associated with a career as an entrepreneur. The lack of education in entrepreneurship might also be a reason. Evidence that supports this conclusion is the fact that

respondents indicated that they currently do not have the right opportunities and resources to become an entrepreneur.

5.5.2. University Offerings

Respondents were also asked several questions related to university offerings at their institute. First of all, respondents were asked to indicate from a list of offerings whether it existed or not. This provided some confusing results, as several respondents indicated that certain offerings, such as courses on entrepreneurship, were present at their institute, while in reality they are not. Possible explanations could be that the respondents 'guessed' or were misinformed.

On the other hand, large percentages of respondents indicated that certain offerings were not offered while in fact they are present, such as the incubator, office space, seed funding, networking with entrepreneurs etc. This has a more obvious explanation: the respondents simply do not know such offerings exist. This is an indication that the university should put more effort in marketing its entrepreneurship offerings. The respondents who indicated a certain offering did not exist were also asked whether they would attend if it existed. The responses to these questions show there is a big interest in courses related to entrepreneurship, and most of the other offerings. In the further analysis, the offerings that in reality do not exist at the institute will not be considered. Particular offerings with large contradictions (either respondents claiming it does exist while it does not or vice versa) have been highlighted.

Table 9: Presence of university offerings at IIIT-H

Offering	Yes (%)	No (%)	Reality?	Would attend if offered? (%)
Course/lectures on Entrepreneurship in General	**36.8**	**63.2**	**No**	**84.8**
Course/lectures on Financing Entrepreneurial Ventures	2.3	97.7	No	66.7
Course/lectures on Technology Entrepreneurship	24.1	75.9	No	82.4
Course/lectures on Software/IT Entrepreneurship	34.5	65.5	No	83.9
Course/lectures on Innovation and idea generation	23.0	77.0	No	86.5
Course/lectures on Social Entrepreneurship	21.8	78.2	No	60.6
Course/lectures on Business Planning	8.0	92.0	No	71.7
Workshops/networking with experienced entrepreneurs	**17.2**	**82.8**	**Yes**	**81.1**
Contact platforms with potential investors	**12.6**	**87.4**	**Yes**	**86.1**
Business plan contests/workshops	**19.5**	**80.5**	**Yes**	**74.2**
Mentoring and coaching programs for entrepreneurs	**11.5**	**88.5**	**Yes**	**70.3**
Contact point for entrepreneurial issues	**13.8**	**86.2**	**Yes**	**84.4**
Free or subsidized office space for start ups	**27.6**	**72.4**	**Yes**	**81.3**
Incubator (either university based or external)	**42.5**	**57.5**	**Yes**	**58.8**
Technology and research resources (library, web)	59.8	40.2	Yes	77.8
Seed funding / Financial support from university	**24.1**	**75.9**	**Yes**	**83.8**

Several questions elaborated on the university offerings that a respondent indicated to be present at IIIT-H. One of these questions was how satisfied each respondent was with the offerings they attended. Unfortunately, the number of respondents that actually attended the offerings was too low to report any meaningful results. Additionally, respondents were asked to indicate their level of agreement with several statements regarding the university offerings in general. The respondents indicated attending the university offerings related to entrepreneurship increased their understanding of entrepreneurs and increased their knowledge on how to start a business. However, they are neutral or slightly disagreed with the statements that the offerings enhanced their practical management skills and that it enhanced their ability to identify opportunities. Responses are mixed about whether the university offers a favorable climate for entrepreneurship.

Overall, the students at IIIT-H seem to have an unclear view of what their university offers in relation to entrepreneurship. Some respondents indicated offerings did not exist while they actually do exist. Even more confusing, some respondents indicated that IIIT-H offers certain things that do not exist in reality. Probable explanations are that students 'assumed' such offerings existed, or felt that other courses contain elements of entrepreneurship. Nonetheless, the survey shows that there is a significant interest in educational offerings at IIIT-H.

5.6. OVERVIEW OF IIIT-H OFFERINGS

This section summarizes the offerings identified at IIIT-H, and the evaluations of these offerings by the founders. Table 10 presents all identified IIIT-H offerings, ordered in three categories. Each offering is given a rating based on the evaluations from the interviews. These rankings range from two plus signs, implying the offering was evaluated as an important contribution to startup success. One plus sign indicates an offering was evaluated as helpful, albeit less crucial than other offerings. A 0 indicates that the founders did not have any experience with the offerings. A minus means the offerings did not contribute to startup success. Additionally, an exemplary quote is provided, from one of the startup interviews, in order to provide an example of how the offering helped the startup. For some offerings no suitable quote is available, these are indicated with N/A (not available).

Table 10: Overview of IIIT-H offerings

		Evaluation	Exemplary interview quote
Center for Entrepreneurship			
	Meeting place	++	*N/A*
	Mentoring	+	*We did have one or two meetings. We had some mentoring. Once in a while I reach out to Kavita and Nirmala, Ramesh and some others. In an informal matter, they always help us. Informally we receive a lot of support from them. But not in a formal matter.*
	Coordination	0	N/A
	Tech. Transfer	+	N/A
Incubator Service			
	Common Working Space	++	*We are very close with each other in terms of knowledge. We share things. For example HR practices; how do we hire employees or interns? On these things, we have good collaboration with the other startups.*
	Office Space	++	*The situation might be different here than where you come from in the Netherlands. One of the issues that we face is getting reasonable commercial space on a rental basis. There are serious power issues, especially during summer. You would have at least two to three hours of power cut. You cannot survive with that kind of situation. What can you do without power? IIIT-H shielded us from all of this. So we could focus on our work.*

	Mentoring	+	N/A
	Networking	+	N/A
	Funding	-	N/A
University Culture			
	Supporting Faculty	++	N/A
	Role Models	+	N/A
	Being part of the university	++	*It also helps just to be inside the university environment. I hired a lot of IIIT students. This would not have been possible if we had been in a different setting. Even if we would have just been two kilometers away. I consider it a very helpful factor. I hear from other entrepreneurs outside of university environments that it is too hard to hire good people. We don't have that problem.*
Student awareness		-	Students are generally unaware of offerings related to entrepreneurship provided by their university.

++ = Important contribution to startup success
+ = Helpful contribution
0 = None of the entrepreneurs had experience with the offering
- = The offering did not significantly benefit the startups

6. UTRECHT UNIVERSITY

6.1. INTRODUCTION

Utrecht University (UU) is one of the oldest research universities in the Netherlands. It was established in 1636. Utrecht University enrolls 30.499 students (2012), making it the largest university in the Netherlands and one of the largest universities in Europe. It is also the highest ranking university in the Netherlands according to the most recent Times Higher Education (2012) ranking and the most recent Shanghai ranking (2011) (Times, 2012).

Utrecht University is organized into seven faculties: the Faculty of Humanities, Faculty of Law, Economics and Governance, Faculty of Geosciences, Faculty of Social and Behavioral Sciences, Faculty of Science, Faculty of Medicine, and the Faculty of Veterinary Medicine. Each of these faculties is divided into several departments that focus on specific disciplines, and which organize related educational programs on both Bachelor and Master level.

Utrecht University has never been known for its focus on entrepreneurship. Utrecht has traditionally been a research university focusing on high quality, fundamental research and academically oriented education. In the past few years, this focus has slowly been shifting: policymakers on both the European, national, and regional level try to persuade universities to more explicitly show their contribution to society. The Dutch call this 'knowledge valorization'. Research is no longer carried out purely for the sake of gaining new knowledge. Research can now also have a more practical application. Universities are even stimulated to conduct 'contract research' for industry. In terms of education, the focus changes from exclusively teaching strict academic disciplines, to a wider curriculum that also prepares students for a life outside academia.

Entrepreneurship is one of the key components of the recent 'knowledge valorization' policy. The efforts are clearly visible: in recent years, Utrecht University launched, amongst others, a technology transfer office, a center for entrepreneurship, a business incubator and several courses in entrepreneurship. All of these efforts should stimulate university faculty and students to obtain 'an entrepreneurial attitude'. Additionally, the efforts are expected to lead to a direct increase in the number of companies started by students and alumni. In this chapter, the effects of all these initiatives will be evaluated by talking to university faculty involved with entrepreneurship, and students and alumni who have started a business in the software industry.

6.2. DATA GATHERING

The case study at Utrecht University was conducted between May 18th and July 1st, 2012. Similarly to the two other case studies, documents and faculty interviews were used to gather information regarding the university offerings. The documents included in the document study range from general websites about the entrepreneurial offerings to course descriptions and (scientific) publications describing course and curriculum design.

Table 11: Interviewed faculty and staff at Utrecht University

Name	Role
Hein Roelfsema	Managing Director Center for Entrepreneurship
Roel Raatgever	Managing Director UtrechtInc

Two faculty interviews have been conducted. Details regarding the two interviews are presented in Table 11. The document study and faculty interviews lead to an overview of entrepreneurship related offerings at Utrecht University. These offerings will be discussed in detail in section 6.3. Afterwards, these offerings serve as input for the founder interviews, where each university offerings is presented and discussed with entrepreneurs who have attended Utrecht University. During these interviews, the entrepreneurs are asked to share their experiences with the offerings and evaluate how they have helped the entrepreneur and/or the company.

6.3. ENTREPRENEURSHIP AT UTRECHT UNIVERSITY

Utrecht University traditionally was not actively stimulating entrepreneurship. Preparing students to become entrepreneurs was not considered a task of academic institutions. However, times have changed. Government policies and successful examples from the US cleared the way for Dutch universities to start creating entrepreneurship offerings. Entrepreneurship is considered as one of the measures to improve 'knowledge valorization'. It is one of the aspects that help show society what happens with the knowledge that is created at the institute.

At Utrecht University, the entrepreneurship offerings emerged from several independent initiatives at the department and faculty level. The identified entrepreneurship-related offerings are presented below, along with their history and a description of their purposes and responsibilities.

6.3.1. The Utrecht Center for Entrepreneurship

The Utrecht School of Economics (part of the faculty of law, economics, and governance) launched a 'center for entrepreneurship' in 2008. This center organized courses focusing on entrepreneurship within the economics school. Later, in January 2011, this 'local' center for entrepreneurship grew out to a university wide center, and started collaborating with the nearby 'HU University of Applied Sciences'. This university wide 'Utrecht Center for Entrepreneurship' (UCE) was issued with the task "*to stimulate and coordinate entrepreneurship education and innovation within the curriculum of Utrecht University and the HU University of Applied Sciences*". In recent years it launched several "*introductory*" courses over at different faculties on the Bachelor level, and it launched a Master program called 'International Entrepreneurship'. The UCE organizes entrepreneurship education open for students from all UU faculties. The UCE does not exclusively try to stimulate students to become entrepreneurs. This is only part of the goal. In a more general sense, the UCE aims to help student to develop an "entrepreneurial attitude", as they mention such an attitude has become an important selection criteria for future employers.

Besides coordinating the entrepreneurship education curriculum, The UCE itself does not offer any other facilities for entrepreneurs. However, they are willing to help aspiring entrepreneurs to find the right offerings both inside and outside the university.

- **Bachelor Education:** The UCE organizes an introductory course related to entrepreneurship open to students from all faculties. This course, which runs multiple times a year, is called 'Essentials of Business and Entrepreneurship' (course code: EC2EBE). Each instance of the course has a similar structure, but differs in the "*domain accent*": each instance is tailored towards a specific domain, such as technology, life sciences, or health care. As the name of the course might reveal, students are taught basic concepts of business and entrepreneurship during the course. It covers a basic introduction to business economics and subjects like entrepreneurial strategy, marketing, operations, and finance. It mixes students from all disciplines and lets them work on a business plan, through which the different entrepreneurship concepts are introduced.

  The introductory course EC2EBE is also the starting point for a minor in entrepreneurship. A minor is a combination of a predefined number of courses focusing on a particular subject. The entrepreneurship minor consists of four courses in total, of which one is an elective course. The remaining two courses focus on specific entrepreneurial skill: Venture Marketing (EC3VM) and Finance for Entrepreneurial Ventures (EC3VF). The former focuses on how to gain a competitive advantage with limited marketing resources. It deals with product development, pricing strategies and market research. The latter focuses on financial issues around new ventures, from the first seed rounds up until an initial public offering (IPO).

  Category: Business Plan Course
  Course Code: EC2EBE
  Course description: https://www.osiris.universiteitutrecht.nl/osistu_ospr/OnderwijsCatalogusSelect.do?selectie=cursus&taal=en&collegejaar=2011&cursus=ec2ebe1

- **Master Education:** The UCE is also responsible for a Master track within the International Economics and Business Master, offered by the School of Economics. In this track, called International Ventures and Entrepreneurship, several courses are specifically tailored towards entrepreneurship, such as International Business Ventures and Sustainable Entrepreneurship. The track, as part of an MSc program in Economics, has a heavy focus on economics, and is restricted to students that have completed a Bachelor in Economics or can otherwise provide proof that they have sufficient knowledge of economics.

  The course Sustainable Entrepreneurship (ECMSE) aims to teach entrepreneurship in a sustainable context. It is described as follows: "*Sustainable entrepreneurship combines the traditional focus of entrepreneurship with an emphasis on opportunities to alleviate social or environmental conditions. Sustainable entrepreneurship is about entrepreneurs striving simultaneously for profit and for improving local and global environmental and social conditions."* Besides covering the 'traditional' challenges of launching and running a new business, it looks at how profit can be aligned with social and environmental goals. During the course, cases are discussed and students have to develop a business plan for a sustainable business. Sustainability is one of the *spear points* of the overall university policy.

  Category: Business Plan Course
  Course Code: ECMSE
  Course description: https://www.osiris.universiteitutrecht.nl/osistu_ospr/OnderwijsCatalogusSelect.do?selectie=cursus&taal=en&collegejaar=2011&cursus=ecmse

International Business Ventures (ECMIBV) focuses on entrepreneurial skill: it teaches venture financing in international startups and multinationals, international accounting, and internationalization strategies. During the course, both the investor's perspective as well as the entrepreneur's perspective is considered.

Category: Entrepreneurial Skill
Course Code: ECMIBV
Course description: https://www.osiris.universiteitutrecht.nl/osistu_ospr/OnderwijsCatalogusSelect.do?selectie=cursus&taal=en&collegejaar=2011&cursus=ecmibv

Another recent offering is a university-wide master track called 'sustainable entrepreneurship & innovation'. This track requires participants to participate in two entrepreneurship-courses and requires that their master thesis research focus on *"the start and implementation of new activities in the area of sustainability within new or established organizations"*

6.3.2. Other educational offerings

The previously discussed offerings are generic entrepreneurship classes for students from all backgrounds. Some of the courses put a small accent on specific domains, but overall they do not focus on a specific industry. However, Utrecht University also offers an entrepreneurship course directly focused on software entrepreneurship:

- **ICT Entrepreneurship (INFOIE):** The Organization and Information group of the Department of Information and Computing Sciences (within the faculty of science) specializes on entrepreneurship within the software industry. Besides performing research on this topic, they created a course within the Business Informatics curriculum called 'ICT Entrepreneurship'. During this course, student teams join the virtual incubator 'Netherware', and create a complete business plan and fully functioning prototype of an innovative software product, which they present to a jury of investors and experienced entrepreneurs. The course is restricted to Information Science and Computing Science masters. However, multi-disciplinary teams are encouraged, as teams need to complete both business-related and technology-related assignment.

  Category: Business Plan Course
  Course Code: INFOIE
  Course description: https://www.osiris.universiteitutrecht.nl/osistu_ospr/OnderwijsCatalogusSelect.do?selectie=cursus&taal=en&collegejaar=2011&cursus=infoie

  The course follows an 'authentic learning' approach as described in (Nab et al., 2010): the education focuses on simulating the real world environment of an entrepreneur. Students deal with problems in the same way as if they are real entrepreneurs. In a similar fashion to the New Enterprises course presented in the MIT case study, the course allows teams to work on a real business idea, which they can continue to develop after completion of the course. The course starts off by requiring students to come up with ideas for a business. This idea is discussed with one of the course lecturers. The ideas are published on a website and the students are asked to form teams. During the course, students work on their business plan and prototype. Several aspects of the business plan are elaborated during the lectures. During a mid-review and end-review, the teams are judged, both on the soundness of their

business plan as well as the quality of the prototype, by a jury of experienced entrepreneurs and investors. In the end, several winning teams are selected. In some editions of the course small funds were awarded as prize money for the winning teams.

- **Other programs, tracks and courses:** The list of offerings presented up until now is not exhaustive. Many other program and course descriptions mention the term 'entrepreneurship'. However, they do not specifically focus on entrepreneurship, and arguably use the term solely for marketing purposes. To maintain a focus on offerings that really influence the entrepreneurial climate at the university, these courses will not be discussed in this thesis.

6.3.3. Graduate on your company

Most Master-programs at Utrecht University require a graduating student to write a 'Master Thesis' quite similar to the one you are currently reading. During the thesis project, students demonstrate their ability to independently conduct and report on a scientific research project. The project is often carried out at an external company, in the form of a research internship or internally at the university. Utrecht University offers select students the ability to graduate 'on their own company'. Student-entrepreneurs can conduct a research project that is not only scientifically relevant, but also benefits the startup he founded or intents to found. Examples are design-science research projects that focus on existing or new products, or other product or portfolio related topics. This way, students can spent more time working for their startup whilst still working towards their graduation.

6.3.4. UtrechtInc

Utrecht University and the HU University of Applied Sciences, which are both situated on the 'Utrecht Science Park Uithof' campus, independently offered small incubation facilities. In 2008, these incubation facilities were merged into the business incubator UtrechtInc. Next to the UU and HU, UtrechtInc is supported by UMC Utrecht, Rabobank Utrecht and the municipal and provincial government. Roel Raatgever, managing director of UtrechtInc, explains the goal of UtrechtInc is to "*help people transform an idea into a successful business. We support them through facilities, network and startup expertise*".

Since 2008, over 40 startups have successfully graduated from the incubator. UtrechtInc currently houses 23 startups. The types of companies that are present in the incubator range from Internet and new-media companies to startups in the area of sustainability, life sciences, and health care innovation. Startups pay a usage fee per square meter of office space per year. The amount of the fee rises each year the startup spends in the incubator. Currently startups pay €200, - per square meter in the first year, €250, - in the second year and €300, - in the third year. However, Raatgever notes this fee is about to change, as it does not cover all costs, and the incubator currently still relies on financial support from its initiators. At this moment the incubator does not yet take up an equity stake in its incubatees, however this could change in the future.

Entrepreneurs, whether they are current students, alumni, or external persons, can join the incubation program and launch their startup with support from UtrechtInc. The startup has to adhere to several requirements: it has to be younger than five years, it has to be a new and original idea, and the idea should be scalable: it should be able to target a global market. Raatgever explains: *"We do*

not offer support for anyone who wants to open a bakery or other small shop. There has to be innovation on the business model or product. It has to be scalable and there has to be an ambition to let it grow quickly. Our 'Big Hairy Audacious Goal' is to have a graduation dinner in 2016 with a minimum of 30 controversial companies with revenue of more than 1 million or more than 10 employees. And they should be able to reach that within the year they graduate from UtrechtInc. When they graduate here, they usually have a few tons of revenue." If the startup fulfills these requirements, UtrechtInc has the following types of facilities and support to offer:

- **Physical Office Space and Infrastructure:** One important offering of UtrechtInc is affordable office space for startups. UtrechtInc maintains two office locations in the city of Utrecht: the 1st floor of the 'Kruytgebouw' at the Utrecht Science Park and one floor at the Oudenoord building of the HU. Entrepreneurs can choose which location they prefer. Both locations offer fully equipped office space, with chairs, desks, coffee, connectivity, and shared meeting space. The offices are located close to each other to promote interaction among the incubated startups. Raatgever explains that this is regarded as one of the most important offerings of UtrechtInc: "*Having people work together and interact. The entrepreneurs generally experience this as the most important aspect. The community support is really important.*"

- **Mentoring**: Incubatees at UtrechtInc receive extensive mentoring, by both internal mentors as well as external advisors. UtrechtInc follows the 'Lean Startup' approach (Ries, 2011): an approach to guide the creation of new products and businesses that emphasizes validated learning, scientific experimentation, and iterative product releases. New startups enter the incubation-program by joining the 'Pressure Cooker'. During this intensive 100-day program the entrepreneurs create a solid foundation for their business: during bi-weekly sessions the entrepreneurs refine their idea, create a business model (using Osterwalder's Business Model Generation Canvas), talk to potential customers and develop a prototype. "*The goal is to finish with either a letter of intent or an actual first client at the end of the pressure cooker,"* Raatgever explains. "*Then they go and present for us, further develop and roll out business plan, create first revenue etc. further down the line the needs for each startup get more specific and therefore mentoring becomes less general."* UtrechtInc provides specific training programs tailored towards the needs of the entrepreneurs. Courses are offered in subjects such as idea pitching, finance, sales, and cold acquisition.

- **Networking**: UtrechtInc maintains a network of informal mentors in a broad range of disciplines, from financial experts to legal advisors and marketing and sales professionals. These mentors make themselves available for startups that require mentoring in these specific areas. Some of the mentors are 'in residence', and spend a few days a month on premises. UtrechtInc also maintains a network with investors in the form of an investors club, and relations to bankers and venture capitalists. Additionally, UtrechtInc offers entrepreneurs in residence (EIR). Entrepreneurs in residence are experienced entrepreneurs who run their own startup business from the incubator. This way, the EIRs can share their knowledge and expertise with their less experienced colleagues.

- **Competitions:** UtrechtInc organizes a yearly regional business plan competition as part of a larger national competition called 'New Venture'. UtrechtInc organizes the regional round of this competition. It is open to any startup in the region, whether they are incubatees or not. The competition creates awareness for the incubator program, and is organized to attract new entrepreneurs. Additionally, UtrechtInc hosts many internal pitching contests for their startups, where they offer tickets for football matches and other small prizes. The startups are asked to pitch their idea in front of a jury. The goal is to keep everyone sharp and focused, ready to pitch at any occasion.

- **Funding:** UtrechtInc provides a pre-seed loan for entrepreneurs. This loan, which is issued as a personal loan, has attractive conditions (such as a relatively low interest). They offer this loan on an as-needed basis, so not every entrepreneur has to use this offering.

6.4. EXPERIENCES OF FOUNDERS FROM UTRECHT UNIVERSITY

The identified offerings explained in the previous section were compiled into a list, and were discussed during the six founder interviews with entrepreneurs that have founded a software startup during or after their education at Utrecht University. The founders were selected based on suggestions by university faculty, suggestions by people from UtrechtInc and the authors' personal network. Four out of the six founders that were interviewed have followed the Business Informatics Master program from the Department of Information and Computing Science. One founder followed a MSc program in Game and Media Technologies, and the sixth founder followed a MA program in Information and Communication Science. Table 12 presents a detailed overview of the interviewed founders.

Table 12: Interviewed Entrepreneurs at Utrecht University

Name	Company	First venture	Founding date	Study	Graduated	Size of team	Employees	Website
Joris Witte	MultiCoen	Yes	feb-11	Business Informatics	sep-12	4	1	www.multicoen.nl
Ivo Hunink	ISVWorld/Site2Mobile	Yes	apr-09	Business Informatics	sep-10	2	n.a.	www.isvworld.com
Bas van Pol	Driply	Yes	aug-08	Communication & Information Science	aug-06	2	6	www.driply.com
Stefan Hospes	Site2Mobile	Yes	feb-11	Game & Media Technologies	feb-12	4	0	www.site2mobile.com
Kevin Voges	AFAS Personal (formerly Yunoo)	Yes	oct-07	Business Informatics	n.a.	4	10	www.afaspersonal.nl
Rob van Weeghel	Dirict	Yes	jan-09	Business Informatics	jan-10	2	3	www.dirict.nl

6.4.1. General Results

The interviewed entrepreneurs all started their business with multiple founders. Three founders started their business along with one co-founder. The three others started with a larger team of four co-founders (themselves included). None of the entrepreneurs had prior experience with entrepreneurship. Five of the six entrepreneurs (except Bas van Pol, Driply) founded their company whilst still studying. One of the entrepreneurs (Joris Witte, MultiCoen) is still studying next to running his business. Three of the startups are currently being incubated at UtrechtInc (ISVWorld, Driply &

Site2Mobile). AFAS Personal and Dirict have both graduated from UtrechtInc in the past few years. AFAS Personal, which used to be called Yunoo, changed its name after it was acquired by a large software company (AFAS) in 2011.

Three out of the six startups (MultiCoen, Driply and AFAS Personal) offer a consumer product. Four startups are pure product-companies. Two startups (Dirict and Site2Mobile) offer software services next to their product offerings. Only one entrepreneur (Bas van Pol, Driply) states that he knew he wanted to become an entrepreneur before he attended the university. The other five got inspired during their study. None of the entrepreneurs considered entrepreneurship as an aspect when deciding to join Utrecht University and/or their specific program. The entrepreneurs chose Utrecht University because they liked the city best or because of the ranking of the university and/or the program compared to other institutes.

The majority of the interviewed entrepreneurs (5 out of 6) completed a degree at the Information & Computing Science department. Four entrepreneurs followed the Master in Business Informatics, a study program focusing on the application and management of IT in businesses, that offers a dedicated 'track' on product software entrepreneurship. However, the tracks within the Business Informatics curriculum are only loosely defined and there is only one course that specifically focuses on entrepreneurship (the ICT entrepreneurship course). The four entrepreneurs from the Business Informatics master all followed the ICT entrepreneurship course. Their experiences with this course will be discussed in the following section.

Five of the six entrepreneurs are currently or have been incubated at UtrechtInc. Two of these companies (Dirict and AFAS Personal) graduated from the incubator in the past few years. Dirict spend two years in the incubator, and moved out because UtrechtInc moved to a different location that they did not like. AFAS Personal spend one year at UtrechtInc and moved out after they received a large capital investment and became too big for the incubator.

6.4.2. UU Offerings

In section 6.3 several offerings related to the fostering of entrepreneurship at Utrecht University have been presented. The interviewed entrepreneurs were asked to elaborate on their experience and evaluation of those different offerings. In this section, these experiences and evaluations on the offerings will be discussed.

The Utrecht Center for Entrepreneurship

As discussed in section 6.3, the CIE organizes several university-wide educational offerings related to entrepreneurship, including a bachelor course and a master track. Unfortunately, none of the interviewed entrepreneurs have had any experience with the CIE or any of its offerings. Some interviewees did not even know of its existence. Possible explanations include that the CIE only exists since January of 2011 and that its offerings mostly focus on the Bachelor-level. However, it does seem

ICT Entrepreneurship

Four out of the six interviewed entrepreneurs followed the Master course 'ICT Entrepreneurship' (ICTE). It is part of the Business Informatics curriculum, however it is open to any Master student at

the Information and Computing Sciences department. The reasons for joining the course differed. Some entrepreneurs already decided to start a business and saw the course as an ideal jumping board. Others simply thought the course was interesting or *"fun"*. They got to know the course through promotion within the Business Informatics curriculum, and department-wide e-mail campaigns.

- **Stimulate entrepreneurship:** ICTE is a crash course into software entrepreneurship: students form teams and within several months they develop a complete business plan and prototype, and present these to a jury consisting of experienced entrepreneurs and investors. Some teams that came out of the course ended up turning their ideas into real businesses. Others did not continue with their team and/or idea, but realized they wanted to become entrepreneurs anyway. Overall, for all entrepreneurs that followed the course, it was their very first experience with entrepreneurship, and ICT entrepreneurship was considered to be one of the main influences why they decided to become entrepreneurs. One entrepreneur explained: "*On forehand I did not think of becoming an entrepreneur. It is a great course for dormant entrepreneurs to wake them up*".

- **Assess entrepreneurial talent/capability:** When asked how ICT entrepreneurship helped them, one entrepreneur explained: *"It taught me to realize that entrepreneurship was something that I could do, to assess my entrepreneurial ability. And in three months you learn several skills and aspects of entrepreneurship. For example I learned how important the team is. I just decided to form a team with a friend of mine. I quickly realized I could not run a company with him. These kinds of things you can also learn in just three months. They helped me to prevent such mistakes in the future."* Another interviewee mentioned: "*I really liked the mid and end reviews. You really had to work towards a goal. There was a jury with a critical view who provided critical feedback on your idea. I really liked those aspects. The most important thing I learned is that entrepreneurship is not magic, and that I could just do it. And I learned that you did not need a large investment to launch a software company. A chair and a laptop in the attic and go"*

- **Different aspects of Software Entrepreneurship:** One entrepreneur explained how ICTE helps specifically with software entrepreneurship: "*The most important aspect is that it forces you to think broader than just the product. The most common trap for software startups is the focus on development of the product, and the believe that as long as your product is superior, customers come automatically. This is not the case. I sell our software without clients ever seeing the actual product. So SW quality and customer acquisition are not connected (unless you focus on consumer market) in business to business. Next to that ICT entrepreneurship connected us to the center for entrepreneurship and the incubator. ICT entrepreneurship is actually a small incubator. The most important aspect of an incubator is that you are in an inspiring environment together with other starting entrepreneurs. You inspire each other. It shows you that there are facilities that you do not have to do everything on your own."*

- **Feedback:** As previously mentioned, an important aspect of the ICTE course is the mid- and end-review by a jury consisting of experienced practitioners and investors. This provides an

important source of feedback and critique that enables the teams to constantly reflect on their decisions and polish their ideas. Additionally, the lecturers provide weekly feedback on all chapters of the business plan whilst it is being developed. Entrepreneurs rated this constant feedback as helpful: "*People involved with the course kept on asking 'why this, why that'. This makes you rethink every step. It forces you to think. And to work out aspects that do not seem fun. You are forced to come up with a complete business plan and not just work on the product.*" One of the downsides mentioned by the entrepreneurs was that because of the high speed and limited duration of the course, there was no time to fundamentally alter ideas. When an idea proved to be unrealizable after a few weeks, the entrepreneurs felt that there was too little time to really do something about it.

- **Funding:** Although not offered consistently, the ICTE lecturers have managed to secure some funds during several editions of the course, which was awarded as prize money for the top-3 teams as selected during the end-review (ranging from 2.000 to 7.500 euro). Two of the interviewed entrepreneurs received prize money in this way. Both of the entrepreneurs indicated that the money was certainly helpful, however not crucial for the existence of their company: "*Not that you could not fund this yourself, but it makes it just a bit easier. You have to worry a bit less*".
  Winning the competition in general was deemed helpful, especially in terms of motivation. As one entrepreneur explains: "*It was really stimulating to win. We had the feeling that we just HAD to continue because it was seemingly a good idea. In the end I think I would be less motivated to continue, so I'm not sure if I would have continued."*

- **Team formation:** Another helpful aspect of the ICTE course was the fact that the students had to work in teams, and experience the importance of having a good team that can work together (or the lack of having such a team). Three of the five interviewees that followed ICT entrepreneurship discovered that their team really works together, and eventually founded the company with the same people. The two others did not continue with their team, because of differing levels of commitment or differing visions. In both cases the entrepreneurs decided to look for other co-founders after the course. These entrepreneurs discovered that not every participant in the course joins with the same goals and level of commitment. In fact, one entrepreneur suggested the course should make a more clear distinction between people who are truly dedicated to start a company and students who join with less ambitious intentions. "*Some people who join the course just go there for easy credits. Whilst others really want to do something more than just that. Maybe the course could be split up for these groups with differing ambitions. Just get pure entrepreneurs together who really want to commit themselves.*"

Graduate on your company

Two of the interviewed entrepreneurs indicated they graduated on a topic related to the domain of their own startup. This was evaluated as helpful, as it allowed the entrepreneurs to "*waste less time working on the thesis*, *and spend more time working on the startup*". The research project can be directed towards market research or product design research, as long as it had some scientific ground. In the end both entrepreneurs struggled with time management, as most of their time was still being spent towards working on the company and not towards writing the actual thesis.

UtrechtInc

Five out of the six interviewed companies are currently being or have been incubated at UtrechtInc. They all indicated that being part of this incubator has helped them significantly. The specific aspects that offered an important contribution to startup success were:

- **Sharing space with others:** "*The most important thing is their network and the collaboration with other entrepreneurs. It is so easy to ask others for common problems that they previously dealt with. So this sharing of experience is so important"* was the answer on the question what was the most important thing the incubator did for a startup. Another entrepreneur suggested the same: *"It is very helpful to be amongst people with the same passion and motivation. And if you have an issue it is really easy to just ask to one of the other entrepreneurs here. And of course the drinks every week is fun and helpful."* Four of the five entrepreneurs indicated that this sharing of common space and meeting other entrepreneurs were the most important benefits of being in an incubator. One entrepreneur rated it as less significant. He indicated that it did not really help him much. He explained that they joined the incubator at a time when they already had an investor who brought in a lot of experience, and they felt they were already a bit further ahead than most other startups.

- **Physical office space:** Although not evaluated as extremely important, all entrepreneurs indicated that it helped to have affordable office space with a professional appearance. One of the reported benefits is that professional office space makes it easier to receive clients and potential investors. Some entrepreneurs also highlighted the simple fact that by having dedicated office space you do not have to continuously work from home, which is uninspiring.

- **Mentoring:** Being in the UtrechtInc incubator also helps in terms of mentoring. The entrepreneurs praised the fact that people from the organization are always available for advice. As one entrepreneur explains "*They help us by constantly asking the question how we were going to differentiate and innovate. Everything there is focused on innovation. Next to that the workshops, like how to call customers and such, were really helpful.*" The entrepreneurs also indicated that the 'Pressure Cooker' is a really important aspect of the mentoring. The strict timeline and deadlines help them to get on track.

- **Networking:** UtrechtInc actively networks incubatees towards business people with all kinds of backgrounds. Several entrepreneurs evaluated this as helpful, especially networking with investors. One entrepreneur explained: "*They help us with financial resources. They know seed investors, business angels, and also banks. Sometimes angel investors come and visit and we can talk to them. Really helpful."* Another entrepreneur explained how UtrechtInc connected him to investors: "*They helped us by allowing us to pitch in front of investors clubs. Eventually we did not take any investment, because our investment needs were too low (60.000 euro). We chose to take out a bank loan. Of course it means more personal risk. The only reason to really look for investors for us was to get experience into the company. To get someone involved that has a lot of experience to guide and mentor us."*

- **Competitions:** UtrechtInc organizes a regional business plan competition, which is open to any entrepreneur in the region. Additionally, there are several other national business plan competitions. Several entrepreneurs participated in at least one business plan competition. It provided them with a way to get free publicity and feedback. *"We always were looking for input from experienced people. And we had a solid business plan to send in, so it took little time. And of course it gives some publicity."*

- **Funding:** Even though it was stated that UtrechtInc provides funding in the form of personal loans with attractive terms, none of the entrepreneurs mentioned they had made use of this offering.

Other University Influences

The entrepreneurs were asked whether they could identify influences from the university that were not mentioned yet.

- **Support from university faculty:** One entrepreneur mentioned that we did not yet talk about the most important benefit for his team: the attitude of university faculty towards entrepreneurial students. He provided examples of how faculty had a flexible attitude and understood that they had to invest a lot of time into the company, at the expense of study progress. Their professor even provided them with small office space to work on their company. He explains: "*What if the university followed all the rules to letter, then we probably would have been expelled or something. The flexible attitude from faculty allowed us to do this. We were in phase where we were juggling on one side our study and on the other side the company. If the university did not cooperate we might have chosen to focus on study instead of the company."*

6.5. ENTREPRENEURSHIP AND CURRENT STUDENTS

The previous section focused on existing entrepreneurs and their experiences with entrepreneurship-related offerings at their institute. This section will look at how current students look at entrepreneurship and the offerings at their institute. What percentage of current students sees entrepreneurship as a career option? How do they evaluate university offerings related to entrepreneurship? The results presented in this section are based on a survey conducted at Utrecht University. The design and content of this survey is discussed in section 2.4.

The survey at Utrecht University was conducted between 29-06-2012 and 13-07-2012. 596 current UU students in the field of Information Technology were invited to participate in the survey. They received the survey invitation by email. The targeted students were all 2nd and 3rd year Bachelor and Master students (both 1st and 2nd years) at the Information and Computing Sciences department. 124 students started the survey. 75 students fully completed their survey responses. Incomplete answers were discarded. This resulted in a response rate of 12.6%. Of the 75 complete respondents, 62 (83%) indicated they were male and 13 (17%) indicated they were female. This is estimated to be in line with the gender distribution of the general population at the department of information and computing science. 21.3 % of respondents indicated they were following a bachelor program. 78.7% of respondents followed a Master program. The age of respondents ranged from 19 to 31 years old,

with an average of 23.53 (std. deviation 2.10). On average, respondents had been studying 5.13 years. However, with a minimum of 1 years and a maximum of 17 years, it is likely that some respondents included the years following primary and secondary education. The majority of respondents followed a Master program in Business Informatics (49%). 25% followed a Computer Science program. The remaining respondents followed Information Science, Game and Media Technology or Artificial Intelligence.

6.5.1. Career Intentions of UU students

One part of the survey focused on career intentions. What kind of career did the respondents expect to pursue right after graduating and five years after graduating? The respondent could choose amongst ten categories, such as "As employee in a small or medium-sized firm (1-249 employees)" or "As a freelancer". A chart summarizing these answers is presented in Figure 13.

A large part of respondents expects to join an existing organization right after graduation. 30% assumes this will be a big company, another 30% expects to join a small to medium-sized business. 9.3% expects to start a new business after graduation. Interestingly, another 9.3% expects to continue in a company that he or she has already started, implying there are several active entrepreneurs among the respondents. Five years after their graduation, almost a quarter of all (22,7%) of respondents imagines to start a business. 12,0% continues in a firm they have already founded. Over 20% of respondents indicate that they do not know what they will bee doing in five years after graduation.

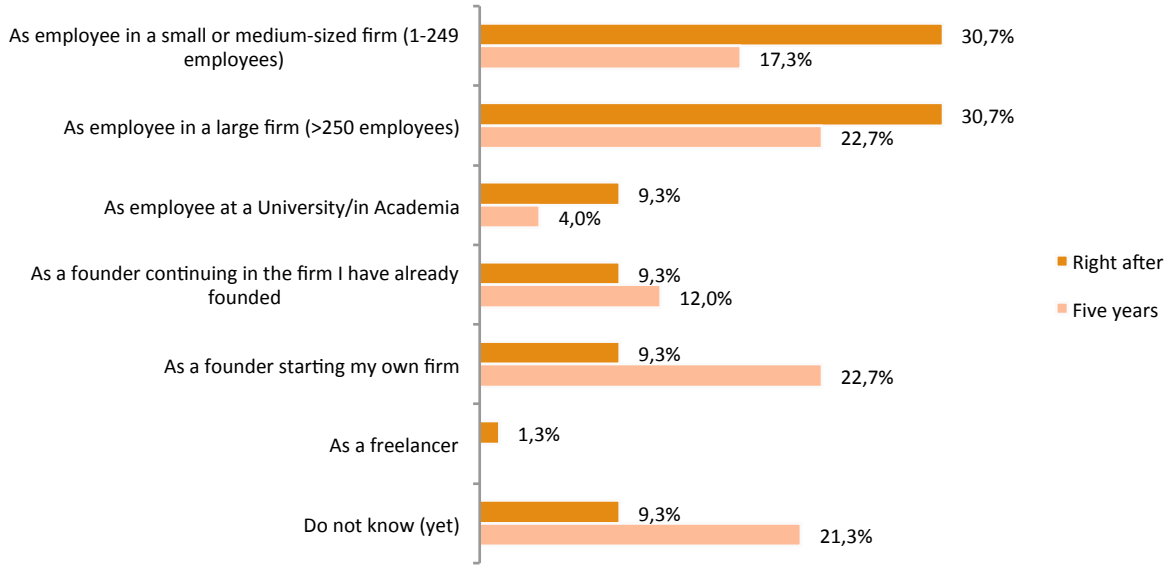

Figure 13: Career intentions of UU students

With almost 10% of students contemplating entrepreneurship, and almost 10% already actively running a business, we can conclude that entrepreneurship 'lives' among UU IT students. To further investigate how students think about entrepreneurship, the respondents were asked how serious they had been thinking about actually founding a company. Respondents could choose options ranging from "Never" to "I have already founded more than one company". Figure 14 presents the

options, along with the percentage of responses. The chart shows that only a minority (13.3%) of respondents has never considered founding a company. The majority (34.7%) has had some slight ideas. All respondents that answered "repeatedly" to "I have already started with the realization" (37,4%) are considered 'intentional founders', as they are likely to start a company at some point. 14,7% of respondents are active founders, as they indicate to have started at least one or more firms.

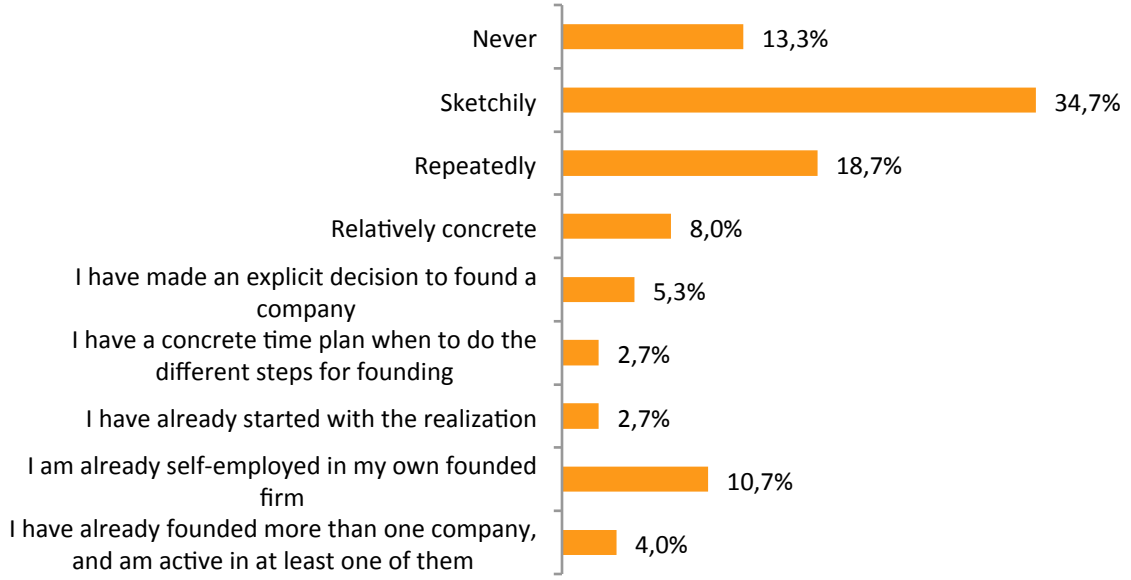

Figure 14: Founding intentions of UU IT students

There seems to be a relatively high percentage of IT students at Utrecht University that have a serious interest in entrepreneurship, and are likely to start a business one day. To further corroborate this observation, an additional survey question asked respondents to provide their agreement with several statements related to the attractiveness of entrepreneurship. Respondents had to indicate their agreement with statements such "*Being an entrepreneur implies more advantages than disadvantages to me*" and "*If I had the opportunity and resources, I would become an entrepreneur*" on a 7-point Likert scale ranging from 1 meaning "strongly disagree" to 7 meaning "strongly agree". The results are presented in Table 13.

Table 13: Attractiveness of entrepreneurship for UU IT students

	N	Mean	Std. Dev.	Mode
Being an entrepreneur implies more advantages than disadvantages to me.	75	4.13	1.605	5
A career as entrepreneur is attractive for me.	75	4.35	1.782	5
If I had the opportunity and resources, I would become an entrepreneur.	75	4.55	1.803	5
Being an entrepreneur would entail great satisfactions for me.	75	4.37	1.836	5
Overall Mean	75	4.35	1.603	N.A.

As a 4 is considered 'neutral', the answers do not really convince that respondents think entrepreneurship is especially attractive, even though there is a slight tendency towards agreement with the statements (the mode, the most frequently chosen answer, indicates most respondents

slightly agree with the statements). These results are contrasting the previous findings, which show a high percentage of UU IT students is thinking about entrepreneurship.

Overall, Utrecht University IT students do think about entrepreneurship. The survey results do show that students think entrepreneurship is attractive to them, although not to high extend. Many students are thinking about founding a company or are already running one, so there is an active entrepreneurial climate among students.

6.5.2. University Offerings

Next to questions regarding career intentions, respondents were asked to answer several questions related to entrepreneurial offerings at Utrecht University. Respondents were presented a list with university offerings. For each offering they had to indicate whether they thought the university offers it or not. The goal of this question is not to learn which offerings are present, but to understand whether the respondents know it exists or not. This indicates how well the university communicates its offerings towards the students. Table 14 summarizes the results. The offerings that are in fact not present are also clearly marked as not present by most students. However, a large number of offerings that are present are marked as not existing by the respondents. This indicated that students do not know what their university offers in terms of entrepreneurship. Particular offerings with large contradictions (respondents claiming something does not exist while it in fact does) have been highlighted in bold font.

Table 14: Presence of university offerings at UU

Offering	Yes (%)	No (%)	Reality?	Would attend if offered? (%)
Course/lectures on Entrepreneurship in General	53.3	46.7	Yes	73.9
Course/lectures on Financing Entrepreneurial Ventures	**12.0**	**88.0**	**Yes**	**54.8**
Course/lectures on Technology Entrepreneurship	17.3	82.7	No	52.5
Course/lectures on Software/IT Entrepreneurship	72.0	28.0	Yes	50.0
Course/lectures on Innovation and idea generation	**14.7**	**85.3**	**Yes**	**69.8**
Course/lectures on Social Entrepreneurship	6.7	93.3	No	19.5
Course/lectures on Business Planning	**21.3**	**78.7**	**Yes**	**50.0**
Workshops/networking with experienced entrepreneurs	**22.7**	**77.3**	**Yes**	**54.1**
Contact platforms with potential investors	**17.3**	**82.7**	**Yes**	**43.6**
Business plan contests/workshops	**17.3**	**82.7**	**Yes**	**33.3**
Mentoring and coaching programs for entrepreneurs	**17.3**	**82.7**	**Yes**	**47.2**
Contact point for entrepreneurial issues	**10.7**	**89.3**	**Yes**	**43.6**
Free or subsidized office space for start ups	**28.0**	**72.0**	**Yes**	**59.4**
Incubator (either university based or external)	**44.0**	**56.0**	**Yes**	**23.5**
Technology and research resources (library, web)	**45.3**	**54.7**	**Yes**	**45.8**
Seed funding / Financial support from university	**5.3**	**94.7**	**Yes**	**62.5**

The large number of ‘wrong’ answers given by respondents show that most students do not know what the institute offers in terms of entrepreneurship. It is worth noting that many of the courses, while open to students from any faculty, are hosted at the Utrecht School of Economics. Maybe this is a reason that the IT students do not know of the existence of these courses. However, there is a clear need for better communication and marketing of entrepreneurial offerings.

Respondents that did indicate an offering existed were presented with additional questions, like whether they attended it and how they would evaluate it. However, the number of respondents that attended each offering is too small too present a meaningful result (more on this in the discussion section). One notable exception is the 'course/lectures on Software/IT entrepreneurship'. 17 survey respondents attended such an offering (most probably the course 'ICT entrepreneurship'), and rated it with 3,94 out of 5, which indicates that were satisfied with the contents of the offering. The respondents that attended one or more offerings were also asked to indicate their agreement with several statements about how the offerings increased their entrepreneurial skills. Overall, they agree that the offerings increased their understanding of entrepreneurship, increased their knowledge on how to start a business, and enhanced their ability to run a business. They also indicated that their university has a favorable climate for entrepreneurship.

Overall, there seems to be a lack of communication in entrepreneurship courses and other entrepreneurship related offerings. IT students from Utrecht University do not know their institute offers in terms of entrepreneurship. One notable exception is a course on software entrepreneurship. Over 93% of respondents knew this existed. One explanation is that this course is offered by the department of Information and Computing Sciences, while the other courses are offered by the Center for Entrepreneurship or the Utrecht School of Economics. Another explanation is that this course focuses specifically on the IT industry.

6.6. OVERVIEW OF UU OFFERINGS

This section summarizes the offerings identified at Utrecht University, and the evaluations of these offerings by the founders. Table 15 presents all identified entrepreneurial offerings, ordered in three categories. Each offering is given a rating based on the evaluations from the interviewed entrepreneurs. These rankings range from two plus signs, implying the offering was evaluated as an important contribution to startup success. One plus sign indicates an offering was evaluated as helpful, albeit less crucial than other offerings. A 0 indicates that the founders did not have any experience with the offerings. A minus means the offerings did not contribute to startup success. Additionally, an exemplary quote is provided, from one of the startup interviews, in order to provide an example of how the offering helped the startup. For some offerings no suitable quote is available, these are indicated with N/A (not available).

Table 15: Overview of Utrecht University offerings

		Evaluation	Exemplary interview quote
Center for Entrepreneurship			
	Mentoring	0	N/A
	Coordination	0	N/A
	Graduate on company	+	*It allowed me to waste less time working on the thesis, and spend more time working on the startup*
	Tech Transfer	0	N/A
Education			
	Business Plan courses	++	*It taught me to realize that entrepreneurship was something that I could do, to assess my entrepreneurial ability. And in three months you learn several skills and aspects of entrepreneurship. For example I learned how important the team is. I just decided to form a team with a friend of mine. I quickly realized I could not run a company with him. These kinds of things you can also learn in just three months. They helped me to prevent such mistakes in the future." Another interviewee mentioned: "I really liked the mid and end reviews. You really had to work towards a goal. There was a jury with a critical view*

			who provided critical feedback on your idea. I really liked those aspects. The most important thing I learned is that entrepreneurship is not magic, and that I could just do it. And I learned that you did not need a large investment to launch a software company. A chair and a laptop in the attic and go
	Entrepreneurial Skill courses	0	N/A
Incubator Service			
	Common Working Space	++	*It is very helpful to be amongst people with the same passion and motivation. And if you have an issue it is really easy to just ask to one of the other entrepreneurs here. And of course the drinks every week is fun and helpful*
	Office Space	+	N/A
	Mentoring	++	*They help us by constantly asking the question how we were going to differentiate and innovate. Everything there is focused on innovation. Next to that the workshops, like how to call customers and such, were really helpful*
	Networking	+	*They help us with financial resources. They know seed investors, business angels, and also banks. Sometimes angel investors come and visit and we can talk to them. Really helpful*
	Business Plan Competition	+	*We always were looking for input from experienced people. And we had a solid business plan to send in, so it took little time. And of course it gives some publicity*
	Funding	0	N/A
University Culture			
	Supporting Faculty	++	*What if the university followed all the rules to letter, then we probably would have been expelled or something. The flexible attitude from faculty allowed us to do this. We were in phase where we were juggling on one side our study and on the other side the company. If the university did not cooperate we might have chosen to focus on study instead of the company.*
	Role Models	0	N/A
Student awareness		-	The student awareness for entrepreneurial offerings at Utrecht University is low. Only

++ = Important contribution to startup success
+ = Helpful contribution
0 = None of the entrepreneurs had experience with the offering
- = The offering did not significantly benefit the startups

7. COMPARING THE THREE CASES: WHAT CAN WE LEARN?

The previous three chapters covered cases of how three different universities deal with the fostering of entrepreneurship, how entrepreneurs experienced those offerings, and how current students look at entrepreneurship. In this chapter, these three cases will be compared, in order to draw conclusions as to what kind of offerings are successful, and why. By zooming in on differences and similarities, we hope to find success patterns and unique offerings that increase understanding of how to foster entrepreneurship at the university level. Additionally, these results can be used by other universities to benchmark, manage, and improve their portfolio of entrepreneurial offerings.

7.1. WHAT METHODS DO UNIVERSITIES HAVE TO FOSTER ENTREPRENEURSHIP?

Aside from the important differences between the three cases, which will be discussed in section 7.4, there are several commonalities. By comparing the three cases and looking for similarities we identified several offerings that promise to contribute towards startup success everywhere, independent of individual differences. This provides an answer to the first research question and its sub questions: Which offerings are provided at universities? How effective are the different offerings at the universities? And how do they contribute to start-up success? Table 16 combines the individual overviews of university offerings, with those offerings that were present at two of the three or all three case universities. Note that a score of '0' means that the founders did not have any experience with the offering, not necessarily that it does not contribute towards success.

Table 16: Overview of common offerings

		MIT	IIIT-H	UU	Overall
Center for Entrepreneurship					
	Meeting place	++	++	x	**++**
	Mentoring	+	+	0	**+**
	Coordination	0	0	0	**0**
	Tech Transfer	0	+	0	**0**
Education					
	Business Plan Courses	++	x	++	**++**
	Entrepreneurial Skill Courses	-	x	0	**-/0**
Incubator Service					
	Common Working Space	++	++	++	**++**
	Office Space	+	++	+	**+**
	Mentoring	+	+	++	**+**
	Networking	++	+	+	**+**
	Business Plan Competition	+	X	+	**+**
	Funding	X	-	0	**0/-**
University Culture					
	Supporting Faculty	++	++	++	**++**
	Role Models	+	+	0	**+**
Student awareness		n/a	Low	Low	**Low**

Center for Entrepreneurship

All three institutes aim to centralize their entrepreneurial offerings under the wing of 'centers for entrepreneurship'. These centers can have differing responsibilities, but generally the centers serve as a place to go for students who are considering starting a business. Additionally, the centers help increase overall visibility of entrepreneurial offerings. At both MIT and Utrecht University, these centers also organize university-wide educational offerings. At MIT and IIIT-H, the Centers for Entrepreneurship provide incubator services, such as free or subsidized office space, networking, and mentoring services. The entrepreneurship centers also organize all kinds of smaller activities, such as talks by experienced entrepreneurs, to inspire students that are interested in entrepreneurship.

These services were identified at two or all three of the cases:

- **Meeting place:** at both MIT and IIIT-H the center for entrepreneurship served as the obvious place to go when you want to do anything related to entrepreneurship. The centers for entrepreneurship function as a meeting point for all students that are interested in entrepreneurship. It brings these people together so they can meet, inspire each other, exchange ideas, and possibly form founding teams.

- **Mentoring:** At both MIT and IIIT-H the center for entrepreneurship housed mentors that made themselves available to offer advice to students. Students can come in, meet with a staff member, and discuss his or her ideas, plans, or problems. This staff member then guides the student to the appropriate offering, person, or resource, either inside or outside the center. These kinds of mentoring services are considered extremely helpful for new entrepreneurs.

- **Coordination:** In all three cases, the entrepreneurship center is an independent organization within the university. It is not dependent on faculties, schools, or departments. Therefore, these centers are able to independently coordinate university-wide entrepreneurial offerings, such as education and incubation. The founders did not have any 'direct' experience with the coordination. However, it is still beneficial to have a central organization responsible for the coordination of all entrepreneurial offerings.

- **Technology Transfer:** Even though all three universities offered technology transfer services, only interviewed founders at IIIT-H explicitly used it. At MIT several founders got inspired by university research and technology, however they did not need to transfer it. At Utrecht University none of the startups used any university technology.

Education

Both MIT and Utrecht University offer several courses that focus on entrepreneurship. These entrepreneurship courses can be divided into two broad categories:

- **Business plan courses:** students work in teams on a real business idea (and sometimes simultaneously on product development, as is the case with ICT Entrepreneurship at Utrecht

University). These courses offer an authentic entrepreneurship experience, as they expose students to real world startup problems and opportunities. At both MIT and Utrecht University, business plan courses have been identified as being among the most important influence that made several of the interviewed entrepreneurs decide to found a company. Business plan courses help students by:

- **Forming teams:** Several entrepreneurs at both MIT and UU explained that a business plan course was their first experience working with a team of founders. Some had positive experiences and decided to continue with the same team configuration. Others experienced difficulties and had to change the team configuration afterwards. Nonetheless, they all learned of the importance of a well functioning founding team, with members that compliment each other.

- **Consider more than just the product:** following the contents of a business plan, the teams have to consider their strategy, target market, customers, competitors, product price, and marketing strategy. This proved helpful as students are often tempted to focus solely on the idea itself, and only start to consider other aspects when the product is already finished.

- **Setting deadlines:** The courses help students to take their ideas and actually start doing something. The interviewed entrepreneurs indicated that it was helpful to have forced deadlines so that they actually had to start working. This not only applied to courses, but also to business plan-competitions and accelerator programs.

- **Pitching:** Another important aspect of the business plan courses is that they force students to practice their pitch. The students have to pitch their ideas to juries consisting of lecturers or experienced entrepreneurs and investors. These pitching rounds offer an important source of feedback, and also prepare the founder for real pitches later on.

- **Assess entrepreneurial skill:** The final benefit of business plan courses is that they teach students what it takes to become an entrepreneur. Therefore, students can assess whether they have the right skillset to pursue an entrepreneurial career.

- **Entrepreneurial skill courses:** In contrast with the broader business plan courses, entrepreneurial skill courses focus on specific skills that are relevant to entrepreneurs. Subjects range from entrepreneurial finance to entrepreneurial strategy or sales and marketing. Only a few entrepreneurs indicated that they followed such specific entrepreneurial skill courses. Entrepreneurs that followed such courses, enrolled after they already started their company. They chose the subjects specifically because they felt that they lacked knowledge in that area. However, they did not indicate that these courses provided a significant contribution towards the success of their entrepreneurial ventures.

Overall, the entrepreneurial skill courses seem less effective in contributing to entrepreneurial success. It would make more sense to offer such courses for entrepreneurs at a later stage, when the entrepreneur realizes which skills need more training. For example, universities could offer such courses in the form of professional courses for alumni.

Incubator Service

All three institutes provide incubator services. As mentioned before, IIIT and MIT offer this as part of their Center for Entrepreneurship. Utrecht University maintains a separate incubator. The incubator services at MIT are offered free of charge for current students and are not open to alumni. At IIIT-H and Utrecht University the incubator services are open for current students, alumni, and external entrepreneurs. However, these institutes charge a usage fee or take up an equity position. The effective incubator services consist of:

- **Common working space together with other entrepreneurs:** incubators bring together entrepreneurs of startups in a similar life phase. These entrepreneurs meet regularly because they have offices close together, share common office facilities and run into each other at social activities. This proved to be the single most important contribution of an incubator everywhere. The young entrepreneurs motivate each other, help each other out with common problems, and share each other's networks and resources.

- **Professional office space:** Software entrepreneurs do not need much more than a desk and a computer to develop their product and business, so in theory they could simply work from home. Nonetheless, practically all interviewed entrepreneurs at all three institutes, identified the access to subsidized professional office space as one of the most valuable aspects of an incubator. It allows them to work in a professional environment, which boosts productivity and motivation. They can host meetings and receive (potential) clients, investors, or other visitors. At IIIT-H, the founders also identified the solid infrastructure as an important contribution towards their success. In India it is not uncommon for power outages to occur, or for the Internet to go down. Reliable electricity and a decent Internet connection are critical for software companies. The university shields the entrepreneurs from power failures by providing backup generators and redundant Internet connections.

- **Mentoring:** All three institutes offer mentoring services as part of their incubation offerings. The mentoring consists of several elements:

    - **Experienced Faculty mentoring:** In all three cases, one of the elements of the support provided by the incubators was that the people involved with the incubator were always available to offer formal and informal advice to the founders. They served as a guide that connect the students to other people and offerings both inside and outside the institute. This support was unanimously evaluated as a helpful offering.

    - **Entrepreneurs in Residence:** Both UU and MIT offer entrepreneurs in residence: experienced entrepreneurs that spend time at the incubator and share their experience and knowledge with their younger colleagues. Only a few founders

mentioned this as helpful, so it is not considered a crucial aspect of the incubator offerings. However, as these EIRs often offer a large network with important contacts, they do contribute to the 'networking services', which is considered a crucial incubator service

- **Accelerator programs:** All three incubators offer accelerator programs as part of their mentoring services. These programs follow a tight schedule, during which participating startups get a change to further develop their business. At MIT this accelerator program takes place during the summer months. As the first edition was held in 2012, the founders did not have any experience with this offering. At UU all new incubatees join the 'pressure cooker' program. This accelerator program helps to get new incubatees quickly on the right track, which was experienced as helpful.

- **Networking services:** another important incubator offering identified in all three case studies are networking services. The incubators assist the young entrepreneurs in reaching the right people. The type of contacts that the incubators help to connect with were most often investors, but also consist of lawyers, accountants, potential partners, and clients. Especially in regions with fewer venture capitalists and other sources of venture funding, this networking becomes more important.

- **Funding:** The incubators at Utrecht University and IIIT-H offer seed funding to the entrepreneurs, in the form of loans or investments in equity. Several of the interviewed founders indicated to have used these funds, however not a single founder rated the funding as a crucial offering. The majority of the founders indicated that they did not require such seed funding, or did not want to commit to a loan. MIT does not offer seed funding as it hold the opinion that it cannot guarantee objectivity if it starts investing in student companies. However, as of 2012 they started offering a kind of scholarship for participators of the summer accelerator program, to allow them to cover rent and living expenses during those months.

The university culture

The founder interviews highlighted that not only the explicit offerings contributed towards their success. They identified several implicit 'offerings' that also provided a significant contribution in terms of inspiration, motivation and advice. These implicit influences are categorized as 'university culture', and relate to what Etzkowitz defined as the 'entrepreneurial university': a university environment that recognizes the importance of entrepreneurship and supports entrepreneurial thinking among its members.

- **Supporting faculty:** Independent of explicit offerings, founders at all three universities rated the supporting attitude of their professors as an incredibly important contribution. Some even argued that they would not have become an entrepreneur if it weren't for their professors. At IIIT-H several interviewees explained how their professor was just as interested in the commercialization of their research that they were prepared to join as co-founders in the new venture. At MIT, interviewees explained how faculty inspired them to

become entrepreneurs as they told stories of their own entrepreneurial ventures. At UU, the founders praised the flexible attitude of professors as the students struggled to keep up their study efforts next to setting up their businesses.

- **Role Models:** Another important aspect that provided entrepreneurs with inspiration to pursue an entrepreneurial career was introducing the students to role models. Several entrepreneurs identified that meeting role models from their own university provided inspiration, and encouraged them that they could also 'do it'. The university should provide a stage for these alumni that became successful entrepreneurs. At MIT students were exposed to successful entrepreneurs as guest lecturers during class, attend public talks or discussion panels, or they could be involved as mentors. At IIIT-H and UU this happened only occasionally.

Student Awareness

At both IIIT-H and Utrecht University, the majority of students were unaware of the offerings related to entrepreneurship at their universities. Students do not know what is offered and where to find it. This does not only harm the effectiveness of entrepreneurship stimulation, but also discourages students with entrepreneurial ideas. Students should be explicitly introduced with (the most important) offerings at their institute, so that they know that there is a place to go if they are interested in entrepreneurship. An example would be to introduce students to the center for entrepreneurship at their institute during the introduction time of a new class.

7.2. UNIQUE OFFERINGS

Next to the identified offerings that the universities have in common, there were also several unique offerings identified during the individual case studies that were valued as helpful by the interviewed founders. The offerings discussed here were not present at any of the other institutes. However, other universities might consider these offerings, as they have proven beneficial to startup success.

University research and technology commercialization course:

At MIT, a course called I-Teams connects students to university research projects and lets them explore the opportunities for commercialization. This course not only teaches students about the different aspects of entrepreneurship, but also promotes university technology transfer. It has many similarities with other business plan courses. The only difference is that the idea is replaced with technology from university research. The course focuses heavily on market research, talking to potential customers and other stakeholders. The interviewees that followed I-Teams indicated this was a very important lesson for them. From a university perspective such a course can be beneficial for the curriculum as it represents an explicit focus on the commercialization of technology.

The MIT 100K Business Plan Competition

Having a business plan competition is by itself not exclusive to MIT, as UU also hosts a business plan competition. However, there was a stark contrast between how entrepreneurs from Utrecht evaluated the business plan competition when compared with the evaluation by their colleagues from Cambridge. There are several differences that might explain this. First of all, the 'hard' reward (the prize money) is significant. Entrepreneurs can win, as the name suggests, up to $100.000,- in

prize money. There are also important differences in the way the business plan competition is organized and promoted at MIT: The 100K competition is organized by current students, with support from the Trust Center; The funds are donated by university alumni; And most importantly, almost anyone at and around MIT seems to know about the 100K competition. People are talking about it, and therefore it draws more attention from others. Because the 100K competition is a big happening for members from the MIT community and surrounding investors and entrepreneurs, the 'soft' rewards also increase: there is a lot more publicity to be gained. Additionally, participating in the 100K is mandatory for students following the Entrepreneurship & Innovation track of the Sloan MBA, which is another way to increase participation.

Alumni network

Another phenomenon observed at MIT that was not as prevalent at the other institutes was the relationship with entrepreneurial alumni. The interviewed faculty members all stayed in touch with many former students who became entrepreneurs. In return for informal advice and networking, the entrepreneurs speak at guest lectures during courses and other talks at the university. This in return functions as a form of entrepreneurship stimulation, as the entrepreneurs serve as role models for current students. At the other institutes there were fewer examples of entrepreneurs with close ties to faculty.

Authentic learning-based entrepreneurship education

Utrecht University has a decent amount of entrepreneurial offerings. Most of them resemble offerings found at the two other institutes. However, the business plan course ICT Entrepreneurship at the department of Information and Computing Sciences is significantly different from other business plan courses. First of all, it focuses specifically on the software business. Business ideas that do not relate to software are not accepted. Secondly, it not only expects students to develop a business plan, but also a complete working prototype of the product. This puts an enormous amount of pressure on students. However it also makes the step towards starting a real business coming out of the course much easier, as there is already a solid foundation for the product. A third reason why Utrecht's IT business plan course is different, is that it is actually a small business plan competition in itself. The student teams compete against each other by pitching their ideas in front of a jury consisting of experienced entrepreneurs and investors. The founder interviews identified ICT entrepreneurship as one of the most important influences for the entrepreneurs in their decision to start a business.

7.3. A MODEL FOR THE FOSTERING OF ENTREPRENEURSHIP

As described in the MIT case study, the Trust center developed a simple model that divides their entrepreneurial offerings into several distinct phases that address specific needs for entrepreneurs at different points in time. These phases were:

- **Idea generation/inspiration phase**
- **Validation phase**
- **Business Planning phase**
- **Competition Phase**
- **Business Accelerator Phase**

This graph mapped the different offerings from the Martin Trust center for MIT Entrepreneurship over several phases. When trying to map all the offerings from all three cases on these phases, it became clear that the phases are not exhaustive for all university offerings, and too specifically tailored towards Trust Center activities. Some offerings could not be mapped onto the existing phases, and most offerings, such as business plan courses and incubators, covered multiple phases at same time. Figure 15 shows the different offerings mapped on the Trust center phases (with addition of an 'inspiration phase' and 'post graduation' phase).

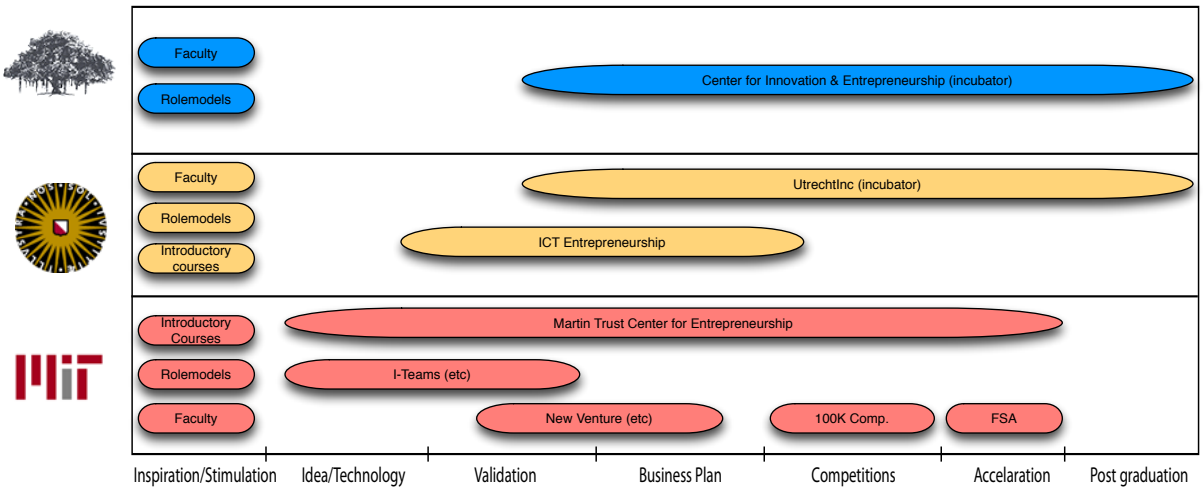

Figure 15: University offerings mapped onto the Trust center phases

However, this graph did provide the inspiration to look at the offerings in terms of specific phases. When examining the figure above, there are basically three main categories that can be identified: the inspiration/stimulation phase is clearly a category of its own, it contains a specific set of offerings. The phases 'idea/technology', 'validation', and 'business plan' have a lot of overlap when looking at the offerings that cover them. All these offerings are related to education. The three remaining phases, competitions, acceleration, and post graduation also have a lot of overlap, and are mostly covered by incubators.

Based on this observation a three-stage model was developed, as presented in Figure 16. The model divides the university offerings over three separate stages: a stimulation stage, an education stage, and an incubation stage. Each stage has a specific goal, and contains specific activities, in order of importance, that could be provided and/or supported in order to reach that goal, and effectively foster entrepreneurship at a university.

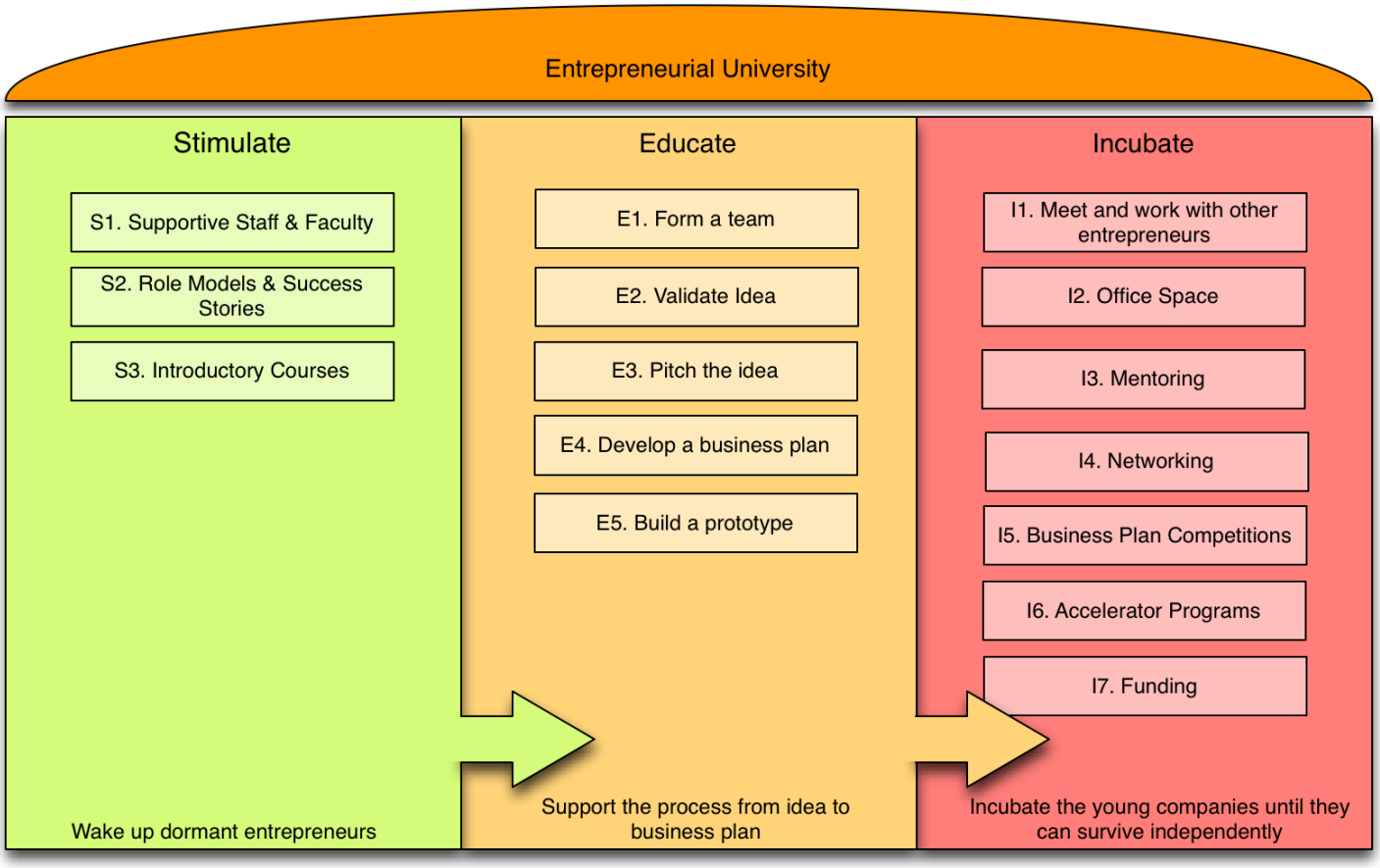

Figure 16: The three-stage fostering entrepreneurship model

Stimulate

The goal of the stimulation stage is to wake up dormant entrepreneurs. It entails creating an environment at the university in which students are made aware of the possibility of becoming an entrepreneur. There are several things that have proven effective during the stimulation phase. The most important one is having university staff and faculty that are supportive towards entrepreneurship and entrepreneurial students (S1). Additionally, it is important to introduce students to role models and success stories (S2). Provide a stage for university alumni that became successful entrepreneurs and host activities that celebrate entrepreneurship. Another activity to promote entrepreneurship is to provide introductory courses (at the bachelor/undergraduate level) (S3). This introduces students to the concept of entrepreneurship, and is also an ideal way to introduce students who become interested to all the other offerings at the institute.

Educate

The goal of the education stage is to support students with a business idea in the transformation from an idea towards a complete business plan. There are several activities where the university can provide support. The most important one is that the university supports the team formation (E1). Promote the formation of multidisciplinary teams by bringing together students that are interested in entrepreneurship. The second most important activity to support is the validation of the idea (E2).

Does the idea have potential? Is it feasible? The remaining activities that could be supported in this phase are the pitching of the idea (E3). The entrepreneur should be able to convince others why his idea is worth investing in or paying for. To further prepare the student (or team) the education stage should also focus on the development of a business plan (E4) and the realization of a prototype (E5).

Incubate

The incubation stage focuses on supporting the launch of an actual company. The offerings in this stage should focus on bringing young entrepreneurs together in a common working space (I1) and providing access to (free or subsidized) professional office space (I2). Additionally, mentoring and networking services should be provided for the young entrepreneurs (I3 & I4). Hosting business plan competitions are an effective way to provide entrepreneurs with mentoring, networking, and publicity (I5). An accelerator program (I6) helps the entrepreneurs to progress faster, by providing a rigid structure with strict deadlines where the entrepreneurs have to show progress. According to the three case studies, which focused exclusively on software entrepreneurship, (seed) funding (I7) is the least important offering during the incubation stage for software companies. It can be helpful for some startups, but it is not as crucial as the other offerings.

The three-stage model provides a clear overview of all the different aspects of stimulating and fostering (software) entrepreneurship. Based on the case studies three stages are identified. The university offerings that contributed towards startup success can be divided over these three stages. Overall, this model provides an answer to the main research question of this project: What methods do universities have to foster entrepreneurship among students?

7.4. THREE DIFFERENT INSTITUTES

Aside from the findings discussed in the previous section, the case studies also broad to light several key differences between the three investigated universities.

- **Reason for joining the university:** Possibly the most important one is the reason why students decided to join the university. At IIIT-H and Utrecht University, the interviewed alumni joined for a range of reasons **except** entrepreneurship. At MIT Sloan, students joined **specifically** because of entrepreneurship. There are several reasons that could explain this important difference. For one: MIT is an institute with a huge global reputation, and this reputation is partly relates to its association with entrepreneurship. Utrecht University and IIIT-H have a very good reputation on a national level, but are not similarly recognized on a global level.

- **Age and experience of students:** Another reason that might explain this phenomenon is the average age and professional experience of students. At MIT, most interviewed entrepreneurs were MBA graduates. Although not an entry requirements of the MBA program at MIT, most applicants have at least several years of work experience and have completed an undergraduate/Bachelor education. Even though the interviewees and most survey respondents at Utrecht University and IIIT-H are also pursuing or have completed a Master education, they joined Master programs that are generally pursued right after the Bachelor, and do not require any previous work experience. Therefore, UU and IIIT-H students have less professional experience and are possibly less conscious about what to do

after graduation. This also shows in the survey results of both IIIT-H and UU: a large percentage of students expected to work at an existing organization first, and in five years from now planned to found a business.

- **Presence of a Business School:** Another important difference is that MIT has a business school, while Utrecht University and IIIT-H do not. A business school has a more natural focus on entrepreneurship, as it is a key aspect of business. Many of the offerings at MIT originated from its business school. This is one of the reasons why MIT has a broader and more developed set of offerings. However, entrepreneurship is no longer confined to the domain of business schools. MIT has more entrepreneurial offerings than IIIT-H and UU. However, the founder interviews revealed that most entrepreneurs only had experience with a small subset of those offerings. More offerings do not necessarily mean that they also all have a similarly significant contribution to the stimulation of entrepreneurship or startup success. The offerings at MIT that proved the most helpful for entrepreneurs, such as the Trust Center for Entrepreneurship, the New Ventures course and the business plan competitions, are in many ways similar to the offerings identified at UU and IIIT-H.

Overall, we can conclude that the number of students with a propensity of becoming an entrepreneur probably differs significantly at the three institutes. It would be only logical to question why comparing these seemingly totally different universities would make sense and render valid results. We argue that this is the only way to render a valid result: at the three institutes several highly similar entrepreneurial offerings were identified. Even though the institutes and its students were completely different in terms of culture, attitude, and experience, they had one thing in common: these similar offerings contributed towards startup success in all three cases. Therefore, it would a reasonable assumption that the entrepreneurship offerings identified in this research will similarly contribute to startup success at universities all across the world, or at the least at other universities across Europe, India and the United States.

7.5. IS THERE A DIFFERENCE IN STUDENTS' ATTITUDE TOWARDS ENTREPRENEURSHIP AT THE DIFFERENT UNIVERSITIES?

At both IIIT-H and Utrecht University surveys were conducted to measure how students looked at entrepreneurship as a career option and how they evaluated the university offerings. The individual results are described in the case study chapters. In this section the results of the two groups are analyzed, in order to test whether there is difference in how students at the two institutes look at entrepreneurship as a career option.

The two samples from IIIT-H (N=87) and UU (N=75) were first compared to ensure the groups are sufficiently similar in terms of variables other than university/nationality. As independent sample T-tests point out, the respondents from IIIT-H and Utrecht University do not significantly differ (α=0.05) in terms of age (22.7 years at IIIT-H compared to 23.5 years at UU, p=0.619), level of study (1.74 at IIIT-H versus 1.79 at UU, p=0,088) and total study duration (5.18 at IIIT-H versus 5.13 at UU, p=0,108). Therefore, the two groups can be considered sufficiently equal. The university is considered the only independent variable.

- **Career intentions:** One of the questions in the survey asked respondents what career they had in mind for themselves right after graduation and five years after graduation. Pearson's Chi Square test points out that there are significant differences in career intentions of IIIT-H students and UU students ($\chi^2(8)=23.504$, $p=<.005$). For example, more Utrecht University students consider starting a business right after graduation (9.7%) than IIIT-H students (4.6%). While IIIT-H students are more likely to start working for a large firm (57.5%) compared to UU students (30.7%).

  Unsurprisingly, there is also a difference in the expectations five years after graduation ($\chi^2(8)=41.633$, $p=<.001$). Five years after graduation, IIIT-H students are more likely to start a company (37.9%) than UU students (22.7%). How strong the effect of which university a respondent comes from has on the respondents career expectations is measured with Cramer's V. The effect the university has on career expectations right after studies is moderate (V= .381), while the effect is considered strong five years after graduation (.507).

- **Entrepreneurship during study:** Utrecht University students are more likely to start a business right after graduation. However, what about entrepreneurship during the studies? Another survey question asked respondents to indicate if, and how serious, they have had been thinking about business ideas. It is interesting to see whether there is a (significant) difference between the respondents from both universities. An independent sample T-test suggests that there is a significant difference in how serious students have been thinking about one or more business ideas. Relatively, there are more students at Utrecht University who are seriously thinking about starting a company. (3.53 compared to 2.89, $p<.05$) .

As this statistical analysis points out, there is indeed a difference in students' attitude towards entrepreneurship. Utrecht University students have a significant higher inclination towards entrepreneurship than IIIT-H students. It is outside the scope of this research project to investigate the reason for this difference. However, when comparing the portfolio of entrepreneurship offerings at both institutes the most striking difference is the complete absence of educational offerings at IIIT-H. Even though there is no research data to support it, it is worth considering adding educational offerings in order to increase the inclination towards entrepreneurship among IIIT-H students. In terms of the three-stage model discussed in the previous section, IIIT-H should focus on developing more offerings in the first and second stage.

7.6. DIFFERENCES IN STUDENT AWARENESS

The survey also investigated the awareness of students regarding the entrepreneurship offering. The results at both universities showed that the awareness is low. Students do not know which courses, facilities, and initiatives their university offers. Table 17 compares the results. As the results show, the awareness regarding the offerings is highly similar between the universities. At both institutes students are unaware of the offerings related to entrepreneurship, with highly similar percentages.

Table 17: Comparing student awareness of offerings

Does it exist?	IIIT-H	UU	Would you attend?	IIIT-H	UU
Educational offerings					
Course/lectures on Entrepreneurship in General	36.8%	53.3%		84.8%	73.9%
Course/lectures on Financing Entrepreneurial Ventures	2.3%	12.0%		66.7%	54.8%
Course/lectures on Technology Entrepreneurship	24.1%	17.3%		82.4%	52.5%
Course/lectures on Software/IT Entrepreneurship	34.5%	72.0%		83.9%	50.0%
Course/lectures on Innovation and idea generation	23.0%	14.7%		86.5%	69.8%
Course/lectures on Social Entrepreneurship	21.8%	6.7%		60.6%	19.5%
Course/lectures on Business Planning	8.0%	21.3%		71.7%	50.0%
Incubator services					
Workshops/networking with experienced entrepreneurs	17.2%	22.7%		81.1%	54.1%
Contact platforms with potential investors	12.6%	17.3%		86.1%	43.6%
Business plan contests/workshops	19.5%	17.3%		74.2%	33.3%
Mentoring and coaching programs for entrepreneurs	11.5%	17.3%		70.3%	47.2%
Contact point for entrepreneurial issues	13.8%	10.7%		84.4%	43.6%
Free or subsidized office space for start ups	27.6%	28.0%		81.3%	59.4%
Incubator (either university based or external)	42.5%	44.0%		58.8%	23.5%
Technology and research resources (library, web)	59.8%	45.3%		77.8%	45.8%
Seed funding / Financial support from university	24.1%	5.3%		83.8%	62.5%

The students that answered ‘no’ to the question whether a certain offering existed at their institute were also asked to indicate whether they would attend the offering if it were present. At both institutes, a high percentage of students indicate that they would be interested in such an offering. Surprisingly, there are also a lot of respondents that indicate they would like to attend certain offerings that are already present. This suggests that either they really could not find out whether such offerings already existed, or that they did not answer the question seriously. Either way, both universities should look at the way information regarding its entrepreneurship offerings is communicated.

8. RECOMMENDATIONS & DISCUSSION

This research project aims to uncover the success-patterns in stimulating and fostering entrepreneurship at universities. It compares three universities, identifies their entrepreneurial offerings, and evaluates these by interviewing business founders that have experienced the offerings. As was shown in the previous chapter, there are several distinct categories where universities can actively contribute towards stimulating the number of new ventures created, and enhancing the changes for success of startups. This starts with the **stimulation** of entrepreneurship among students, continues with the **education** of prospective entrepreneurs, and ends with the **incubation** of young startups.

8.1. RECOMMENDATIONS FOR UTRECHT UNIVERSITY

This research project investigates the entrepreneurial offerings of three universities. Several initiatives that contribute to startup success are identified and the results can be used to create a more effective set of offerings for the fostering of entrepreneurship at any university. This section presents several important recommendations specifically for Utrecht University.

- **Increase marketing efforts and focus on the stimulation phase:** Utrecht University scores reasonably well in the number of offerings related to entrepreneurship. However, Utrecht University is not 'known' for its entrepreneurial offerings. Most students do not know about the entrepreneurial offerings until they actively start looking for it. Therefore the university should intensify its offerings in the stimulation-phase. Introduce the students to potential role models, host talks by successful entrepreneurs, and promote (and introduce more) introductory courses. This also relates to the role of the Center for Entrepreneurship. Currently the UCE is not sufficiently known. Let students know that there is a UCE, and make sure that there is staff available to meet with interested students to educate them of the other offerings. For example, students could be introduced to the UCE and other entrepreneurial offerings during the introduction week, where new Bachelor and Master students are introduced to a broad array of university facilities and offerings. If it is important for students to be introduced to the cultural center and the sports center, then why not introduce them to the entrepreneurship center as well?

- **Accessible Incubator offerings for interested students:** Utrecht University offers an incubator, which is open to current students, alumni, and other aspiring entrepreneurs. However, this incubator demands a formal commitment and charges a monthly fee. For current students who run a business next to their course-work, this is not a practical solution, as they often cannot commit enough time to justify the cost of the professional office space. The university should offer basic incubation services for these students free of charge, in the form of co-working space dedicated for student entrepreneurs. This incubation service should provide them with a place to work, to meet other entrepreneurs, and provide the ability to ask for advice. This center for current students could be a part of the current UtrechtInc, so that the participating students can 'upgrade' to the full set of UtrechtInc services as soon as they are ready for it.

- **Increase Master-level education offerings:** Utrecht University could extend the number of business plan courses directed at Master students, such as ICT Entrepreneurship, each with a focus on a specific industry. This way, interested students from any discipline can get experience with what its like to start a business. Furthermore, such courses can serve as an introduction into additional entrepreneurship related offerings, for students that prove to be seriously interested. Currently, there are only a few courses related to entrepreneurship open for Master students. Additionally, Master students often have a tight curriculum of one or two years, with relatively little room to cross-register at other faculties. Therefore, the number of entrepreneurship courses should be increased, and they should directly relate to the discipline/industry of a specific Master program.

- **Authentic-learning based Entrepreneurship Education:** Authentic-learning courses, such as ICT entrepreneurship, came out as a highly effective offering in terms of the stimulation of entrepreneurship. However, there are still several things that could be improved. For example, during the founder interviews, it came to light that not every participant in the course shares the same level of commitment. Some founders felt that they got stuck with less ambitious team members, which affected their performance. This is simply a part of college life, a normal aspect of any course that requires teamwork. However, the team forming before the start of the course could be enhanced. Currently, students themselves are responsible for contacting potential team members. This selection process could be facilitated by introducing team-forming sessions. These sessions could contain speed-dating sessions and/or pitching sessions. It makes sure that team members can get to know each other before the start of the course, and to make sure everyone shares the same ambitions.

  Additionally, ICT entrepreneurship could be opened up to students from other programs. Now ICTE is open for computer science and business informatics students. However, due to the multidisciplinary nature of the course, not every team member needs to have a IT background in order to be successful. At MIT, founders praised the multidisciplinary teams during coursework. Why not introduce this at ICT entrepreneurship?

- **Alumni Network:** Utrecht University should increase its efforts to maintain an active alumni network. As the survey results show, many students do not intend to start a business right after graduation, but plan to become an entrepreneur later in their career. These indirect founders should remain in contact with the university, as this provides benefits for both parties. On one hand, the founder can serve as role model for current students and can help promote and stimulate entrepreneurship. On the other hand, by staying in the touch the founder can keep up to speed with new university research and technology developments. This could lead to an increase in spin off activity. Additionally, these founders might be interested in following professional courses in entrepreneurship. This could lead to an important source of (additional) income for the university.

8.2. DISCUSSION

The offerings identified in this research are not new, and most of them are not unique. As presented in the discussion of related literature in chapter 3, most of these offerings have already been discussed in scientific literature. However, this research adds to the body of knowledge by identifying the specific factors that make these offerings successful for students and startups, and by dividing and ordering the offerings over different phases. As to the best the authors' knowledge, this has not been done before. The model proposed in previous chapter categorizes those initiatives that contribute most to entrepreneurship in three separate stages. This provides insights in how individual offerings contribute to the fostering of entrepreneurship at a university. Additionally, this model can support university policymakers in the coordination of existing and new entrepreneurial offerings.

There are however several important limitations that threat the ability to generalize the results of this study. Some limitations were introduced due to the strict time constraints and lack of resources. Several other limitations are caused by problems with the research approach and survey design, which were unfortunately irreversible. The remainder of this section will discuss these limitations; explain how they affect the generalizability, and how future research should account for them.

- **Survey Design:** One part of the survey focused on university offerings. The survey started by asking respondents to indicate which offerings existed at their institute. The respondents were then asked, for offerings that did exist, whether they had attended them and how they would evaluate them. These questions could have supported the interview findings, to strengthen the conclusions of which offerings are contributing to entrepreneurial success and why. However, the results of this part of the survey were almost unusable, as respondents were unable to accurately indicate which offerings existed at their university and which did not. This probably had to do with the number of offerings that were presented to the respondents, and the general naming of these offerings. Respondents where overwhelmed with choices, and probably did not recognize the offerings that did exist (because of the general name) or did not bother to spend much time answering the question correctly. In the future, this problem could be avoided by generating a specific list of offerings for each individual institute, under their local names. This way, the list of offerings presented to the respondent is much shorter.

- **Survey responses:** Another problem with the survey concerns the responses. First of all, the survey was supposed to be conducted at all three institutes. However, we weren't able to distribute the survey amongst relevant MIT students. Furthermore, response rates at the other two institutes were low (in both cases less than 15%). This threats the representativeness of the sample in relation to the whole student population. Can these relatively few students represent the whole population? The main reasons for the low response rates were that we did not offer a reward for responding to the survey, and that we did not have the ability to send reminders. In future research, this problem can be prevented by drawing a random reward for one or a few respondents, and by implementing a system to determine who has not yet responded to the survey, so that they can receive a reminder.

- **Interview candidate selection:** Even though the number of interviewees per case is seen as sufficient, as the interviews continued until no significant new information was introduced, the selection of these interviewees is not ideal. One or two faculty members of each institute suggested and introduced the interview candidates. Especially at big institutes, such as MIT and UU, this presents a risk that only a subset of startups has been included. For example, we might have missed startups that did not make much use of university offerings, and were therefore not known by the university faculty. These entrepreneurs might have had good reasons why they did not attend these offerings. Additionally, only 'successful' entrepreneurs were included. None of the interviewees had started a business that did not succeed. Therefore, this research only considers the success stories, and does not give insights in how startup failure can be prevented. Future research should try to randomize the interview candidates as much as possible; to make sure a complete view is obtained.

- **Omitted 'indirect' entrepreneurs:** The founder interviews were conducted with entrepreneurs that graduated from the university less then five years ago. This restriction was necessary to improve comparability of the cases, as the number of offerings differs over time. However, this led to the omission of an important group of entrepreneurs: the entrepreneurs that did not start right after graduation, but later. As the survey results suggests, a significant number of students expect to found a company five years after graduation. These 'indirect' entrepreneurs probably still benefited from certain university offerings. However, their experiences have not been considered in this research.

- **Analysis of the findings:** The research consisted of many interviews, which were spread over a fairly long amount of time (the first interview, in India, took place on 14/02/2012, while the last interview in Utrecht took place on 27/06/2012). Ideally, the analysis of each interview should have been conducted right after each interview itself. This way, concepts identified at one interview could be further explored in further interviews, and therefore would have improved the interview results. This would also have enabled a proper grounded-theory analysis (as this iterative approach is one the key goals). Unfortunately, due to strict time constraints during the data gathering in India and the United States, this was not feasible. Therefore, future research should start with analysis right after each interview, and continue analysis in parallel with the interviews.

- **Model development:** Another important limitation of this research relates to the proposed fostering entrepreneurship model, as depicted in Figure 16. The model is the result of an analysis of all university offerings at the three case universities. What did these offerings contribute towards startup success? Based on evaluations from the founder interviews, these contributions were ranked in the model. It is important to realize that the model is only valid for the observations at the three case universities. It is not evaluated or validated through further case studies or interviews. This model is a proposition, and further research should be conducted to validate and (possibly) change or extend the model based on observations at other universities.

Overall, these limitations and issues do not necessarily affect the validity of the findings. The findings of this study are valid, relevant, and do provide important insights in how to foster entrepreneurship

at universities. However, the findings could have been more elaborate, with stronger support and a higher generalizability if these problems would have been addressed properly. Nonetheless, the successful offerings and the resulting model provided in this research could serve as an important tool is assessing universities' entrepreneurial offerings. How do they fit in relation to the three-stage model? Moreover, is every phase covered? In the next chapter several important suggestions for further research will be discussed.

9. CONCLUSIONS AND FURTHER RESEARCH

The trigger of this research project is Utrecht University's need for understanding whether its efforts in terms of fostering entrepreneurship yield desired results. Getting more students to launch innovative startups does not just happen overnight, and requires an active policy that encourages, celebrates, and fosters entrepreneurship. There is a plethora of initiatives that could potentially stimulate entrepreneurship and foster the survival and growth of new startups. However, what do they contribute exactly? Which initiatives are the most effective? Is it better to focus on educating entrepreneurship, or do incubator services have more impact? Or is there a combination of both that proves most effective?

9.1. STIMULATE, EDUCATE, INCUBATE

Detailed case studies of three different universities provided insights in how to foster entrepreneurship at universities. Each university has a different approach, with unique offerings that help create awareness of entrepreneurial opportunities and guide entrepreneurs as they develop a business. More importantly, comparing the interviews with 21 entrepreneurs from three different universities that share the intention to foster entrepreneurship led to the discovery of several general success-patterns. Not every founder had the same experiences, and not everyone attributed a similar role for their alma mater in explaining their success. However, based on the interviews, a model is proposed, and three separate stages are identified in which entrepreneurs significantly benefit from certain entrepreneurial offerings at their university. The stages over which a university can coordinate its offerings are the stimulation stage, the education stage, and the incubation stage.

Each stage contains specific needs and activities that should be addressed by university offerings. For example, offerings in the stimulation stage should focus on creating awareness of the opportunities regarding entrepreneurship, by providing supportive faculty that are enthusiastic about entrepreneurship, by celebrating role models and success stories, and by providing introductory courses that present the main concepts of entrepreneurship in general. The education stage should facilitate interested students by teaching them the skills and letting them experience what it is like to be an entrepreneur, so that they realize whether this is something they really want to do. Lastly, the incubation stage covers activities to support young startup teams. It covers things such as office space, meeting other entrepreneurs and mentoring services. The three-stages model is presented in Figure 16. At the three institutes, there were several inspiring examples of offerings that addressed these specific stages. For example courses such as New Ventures at MIT and ICT Entrepreneurship at Utrecht University perfectly cover the activities in the education phase. Another example is the Center for Entrepreneurship at IIIT-H, which completely addresses the incubation phase.

The findings in this research are in line with the recommendations of Franke & Lüthje (2004). They make the following recommendations to foster entrepreneurship; universities should establish an entrepreneurship center, focus on courses that stimulate the creation of new enterprises, provide role models in teaching, intensify experimental learning and real-world experience wit regard to the startup process and establish a support network for beginning entrepreneurs. However, the present research extends these findings by explaining how these individual activities contribute to the effective fostering of entrepreneurship.

Next to the case studies, a survey was conducted among students from IIIT-H and Utrecht University, in order to provide an answer to the question whether there was a difference in how students look at entrepreneurship. This survey investigated the career expectation of these students, as well as their evaluation of university offerings. 10% of IT students from Utrecht expect to found a business right after graduation. More important, over 37% of students have already considered one or more business ideas. Students are definitely interested in entrepreneurship. Overall, students from Utrecht have a higher propensity towards entrepreneurship than IIIT-H students. The majority of IIIT-H students expect to go work for a large firm right after graduation. However, after five years, over 37% of respondents expects to start a business. This indicates that there is a significant amount of students that are interested in entrepreneurship. The reasons why they do not want to start a business right after graduation should be further investigated.

9.2. FURTHER RESEARCH

There are several directions for further research that validate, improve, or extend the findings from this research. First of all, the proposed model should be tested on completeness and generalizability by validating it through further case studies at other universities. The current model is based on case studies at universities in Europe, the US and India. However, to what extent does it apply at universities from different parts of the world, such as China, South America, or Africa.

Additionally, the present research only considered existing offerings and evaluated their contribution ex post. It would be interesting to measure the effect of individual offerings by comparing the situation before, during, and after implementation. To what extent do specific offerings affect the number of direct entrepreneurs (entrepreneurs that start right after graduation) and indirect entrepreneurs (that become entrepreneurs later in their career)? To what extent do the career intentions change?

Another research direction that is interesting to investigate is to what extent specific offerings affect entrepreneurs and their companies, by comparing entrepreneurs that did and did not follow specific offerings. What are the differences between the two entrepreneurs, and how do they relate to that specific offering? Does a single offering have a measurable contribution to a startups success? It is also interesting to investigate the entrepreneurs that did not succeed. Why did they start, and more importantly, why did they quit? In addition, how does this relate to the university offerings?

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APPENDIX

CASE STUDY PROTOCOL

INTRODUCTION TO THE CASE STUDY AND PURPOSE OF PROTOCOL

As a part of the thesis project on the fostering of software entrepreneurship, a multiple-case study will be performed. The goal of the multiple-case study is to identify what universities offer in terms of entrepreneurship stimulation and how these university offerings related to entrepreneurship have benefited university spin-offs.

The multiple-case study consists of three case studies. The three case studies will be performed at Utrecht University, MIT and IIIT Hyderabad. These cases have been selected, as they are key-cases of universities actively trying to stimulate entrepreneurship among students, but vary in the current maturity of their efforts. This document explains the case study protocol. This protocol serves as a manual during the execution of the case studies, in order to ensure each case is studied in a similar way and that all questions are answered.

As mentioned before, this case study is part of a larger project on the fostering of software entrepreneurship. In recent years, entrepreneurship has become one of the most important drivers of the global economy. Universities, often encouraged by local governments, started to realize their potential influence in the local entrepreneurial climate. With a broad array of initiatives to stimulate entrepreneurship on, and around, campus, universities around the world take part in the pursuit to create a local copy of highly innovative entrepreneurship clusters like Silicon Valley and Route 128.

However, most universities do not have insight in the effectiveness of their entrepreneurship stimulating initiatives. What initiatives contribute to start-up success, in what order, and to what extent?

This case study is performed in order to answer the following questions:

- What initiatives are employed at universities in order to stimulate entrepreneurship among students?
- What initiatives did start-ups that originated from the university use, and why?
- If the startups used several initiatives, in what order did they use them, and why?
- How did the initiatives that the startup used contribute to its success?

DATA COLLECTION PROCEDURES

In order to get a complete view of both the university offerings as well as how they influenced startups that emerged from the university, a combination of both document study as well as interviews will be performed.

Document Study

The goal of the document study is to discover what the case university is offering in terms of entrepreneurship stimulating initiatives. These initiatives could range from courses, incubators, business plan competitions, etc. The types of documents that will be studied are:

- Course Description/Outlines
- University Websites
- (Scientific) publications on entrepreneurship stimulating activities
  Publications like:
    - Case-studies on specific initiatives
    - Status reports on specific initiatives
    - Publications comparing initiatives at the university with that of others
    - University wide publications concerning all entrepreneurship stimulating activities

The findings will be captured in a table, with several columns containing relevant data per initiative (when was it launched, startups produced etc.). To maintain a detailed chain of evidence, a reference to the source of the data will be included. The relevant documents themselves will be captured in the case study database. This final table is used as input for the interviews at the startups that originated from the university.

Interviews at local startups

To answer the questions relating to the effectiveness of the entrepreneurship stimulating initiatives, several interviews at local startups will be performed. These semi-structured interviews will consist of several predetermined questions. The choice for semi-structured interviews as opposed to fully structured interviews is that semi-structured interviews leave room for additional questions and input from the interviewee. For example, in case the document study appears to be incomplete and that the interviewee presents unknown university initiatives.

The types of start-up companies that are eligible to be interviewed are companies that have been founded by university alumni or current university students active in the software sector (specifically: companies that provide a software product or software services). These companies do not necessarily have to be founded during or after the founder(s) attended the university, because companies founded before the founder started attending the university could also be influenced by entrepreneurship offerings from the university. The eligible start-up companies will be approached using contacts from the respective university, or alternatively using contact details as found on company websites.

The types of people that will be interviewed at the start-up companies are the founder(s) of the companies. They have witnessed firsthand how their company grew from an idea into a product or service, and can provide input on how university offerings influenced their ideas, decisions, strategy and roadmap. In the case such a company was founded by more than one founder, the interviewer will try to arrange interviews with all those founders (separate or as a group), as they could have different experiences and a different vision on how university offerings affected their company. Prior to the actual interviews, the researcher will study all internet-resources that are available related to the company where the interview takes place and/or the interviewed founder.

Themes that will be discussed during the interviews are:

- **Introduction to the research and why it is conducted**
- **General Information on company**
    - What does it do?
    - For what markets?
    - How many employees
    - Some numbers related to growth/success
- **The history of the company**
    - When was it founded?
    - What was the founder's situation at that time?
    - Why did he/she decide to become an entrepreneur?
    - Is this your first venture?
    - If multiple founders:
        - How did you form the team?
        - Where did you meet the co-founders?
        - How do the team members compliment each other?
- **History of founder (or team)**
    - Did you have any prior experience with entrepreneurship?
    - Did you have any prior experience with the team of founders?
- **The University Context**
    - What was (were) the reason(s) to join this university?
    - Did the founder want to become an entrepreneur before he joined the university? (or decided during)
    - **University Offerings**
        - Present different university offerings one by one and ask:
        - Did you know about the existence of this offering, while you attended the university?
        - Do you have experience with the offering (did you attend)?
        - When?
        - In what start-up phase was your company when you attended the offering?
        - How do you rate it, on a scale of 1-5 (1 being not useful 5 being very useful)
        - Based on the previous answers, there will be unstructured questions relating to the university offering
    - Were there any other influences from the university that we have not talked about?
    - Would you be here if you did not attend any of the university entrepreneurship offerings?

Interviews are expected to take one to two hours, and will be performed on site. Interviews will be recorded using a voice-recorder and relevant parts will be transcribed. These transcriptions will be added to the case study database. If the interviewee feels uncomfortable being recorded, notes will be taken instead. The complete interview protocol is available as an appendix to this report.

Case Study Analysis

After the data collection, a concise case study report will be created. This case study report will contain an introduction on the case subject (the university) as well as on the startups were interviews have been conducted.

The outline for these reports will contain:

- Case Introduction
  - History of the university
  - Regional environment
  - Role of entrepreneurship
- University Offerings
- Interviewed Startups
  - History of startup
  - General description
  - Interview data (when, how, how long etc.)

Next to that, a schematic overview of all entrepreneurship related university offerings will be created, with overall information on each offering as well as excerpts of the interview results (per interview), relating to the effectiveness of these offerings. This case study report will serve as a basis for the chapter in the thesis document.

	Technology Incubator	**Course ICT Entrepreneurship**
Startup1		
Did attend?	X	Y
When?	X	2004
Phase?	X	Business model development
Rating?	X	4
Experience (quotes)	X	"This course helped with…"
Startup2		
Did attend?	Y	X
When?	2007	X

After all three case studies have been conducted, a comparative report will be written. This report describes the resemblances and differences between university offerings over the three universities. The three schematic overviews will be combined, in order to create a framework depicting all university offerings, which universities offer them and how start-ups experienced these offerings.

This comparison framework will be enhanced with survey results, which will be gathered in another phase of the thesis project.

SURVEY DESIGN

PURPOSE & APPROACH

The survey research aims to identify regional differences in entrepreneurial attitude among students by comparing quantitative data. The survey will be held among a sample of Computer Science and Information Science students from each of the universities were the case studies are performed. The initial goal is to collect at least 100 respondents per university. The survey results are expected to corroborate the case study results by measuring how students evaluate the effectiveness of the facilities offered by their university. Next to that, the survey tries to provide some additional insights in students' ambitions in entrepreneurship over different regions.

The survey is designed around three separate topics: personal background, university offerings, and career expectations/entrepreneurial intention. The personal background questions will ask questions relating to their study background, age, nationality etc., in order to test whether there is a difference between certain subgroups in the population of CS/IS students. The university offerings questions will deal with entrepreneurship related offerings. Several of those offerings are presented and respondents are asked whether their university offers them, if they attended them and how they rate them. The career expectations/entrepreneurial intention questions will ask respondents if they already know what career they want to pursue, if their choice of university was influenced by what they wanted to become and how likely it is that the respondent will become an entrepreneur one day.

The survey will be conducted over the Internet. As the population consists purely of computer science and information science students currently enrolled at one of the universities, it can be assumed that each subject has access to the survey and is able to fill it. The survey will be created using the open source tool 'LimeSurvey', and will be hosted on a dedicated webserver.

SURVEY OUTLINE & QUESTIONS

In this section, the survey outline as well as its question will be explained. The survey starts with a short introduction stating the purpose of the survey and who qualifies to participate. The questions are organized over the three survey themes.

Introduction

Dear [INSTITUTE] student,

Utrecht University is performing a research project on the differences in career intentions among IT students at universities in the US, Europe and India. [INSTITUTE] is one of the institutes that participate in this research. Therefore, we would like to invite you to participate in a short questionnaire, in order to get an idea which career you have in mind for yourself.

This online questionnaire consists of three pages of questions. We estimate it will take a maximum of 15 minutes to complete. The response of this questionnaire will be treated confidentially. Your response is very important for the success of this research, so please fill out the questionnaire as careful and serious as possible.

We hope you will spare some time and answer this questionnaire. If you have any questions/comments or want more information regarding the questionnaire, send an email to: t.jacobusmeergenaamdvandezande@uu.nl

The questionnaire can be reached at this URL: http://www.eshipsurvey.nl/

Thank you so much!

Kind regards,

University Offerings Questions

These questions relate to the following list of potential university offerings:

Lectures and/or courses on	***Incubation, networking & Coaching***	**Provision of resources for founders/entrepreneurs**
Entrepreneurship in general	Workshops/networking with experienced entrepreneurs	Technology and research resources (library, web)
Financing Entrepreneurial Ventures	Contact platforms with potential investors	Seed funding / Financial Support from university
Technology Entrepreneurship	Business plan contests / workshops	
Software/IT entrepreneurship	Mentoring and coaching programs for entrepreneurs	
Innovation and idea generation	Contact point for entrepreneurial issues	
Social Entrepreneurship	Office space for start-ups	
Business Planning	Incubator (external or university owned)	

NOTE: Pending technical possibilities of the survey tool, the following questions will be combined in an interactive matrix style question.

Question ID: 1.1

Question: What entrepreneurship related facilities does the university offer?

Type: Checkbox (Yes, no/don't know)

The following questions deal with the University offerings where you indicated that they exist:

Question ID: 1.2

Question: Did you attend?

Type: Yes/no

IF attended:

Question ID: 1.3

Question: How satisfied were you?

Type: Rate (1-5) 1=not at all, 5= very much

Question ID 1.4

Question: Indicate your level of agreement with the following statements about the university environment.

Type:

The University offerings I attended… (1=strongly disagree, 7=strongly agree)

		1	2	3	4	5	6	7
1	…increased my understanding of the attitudes, values and motivations of entrepreneurs.							
2	…increased my understanding of the actions someone has to take in order to start a business.							
3	…enhanced my practical management skills in order to start a business.							
4	…enhanced my ability to develop networks.							
5	…enhanced my ability to identify an opportunity.							
6	There is a favorable climate and premises for becoming an entrepreneur at my University.							
7	At my University I found many entrepreneurial-minded classmates.							
8	Thinking about any classes or training in entrepreneurship that you have had, were they mainly imparting knowledge (1) or could you work on own entrepreneurial ideas (7)?							

QUESTION ID: 1.5

Question: Could you explain (one of) your best experiences with the university offerings you attended?

Type: Long textbox

The following questions deal with the University offerings where you indicated that they do not exist / that you do not know:

Question ID: 1.6

Question: You indicated that these offerings did not exist, or you did not know they exist. Would you like them or not?

Type: Choice (I would like it/ no, I do not need it)

Career Expectations / Entrepreneurial Intentions questions

Question ID 2.1

Question: Which career path do you intend to pursue right after completion of your studies, and which career path 5 years after completion of studies? Only choose 1 option for each point in time.

	Right after studies	**5 years after studies**
As employee:		
…in a small or medium-sized firm (1-249 employees)	( ) (1a)	( ) (1b)
…in a large firm (>250 employees)	( ) (2a)	( ) (2b)
…at a University/in Academia	( ) (3a)	( ) (3a)
…in public service	( ) (4a)	( ) (4b)
As a founder		
…continuance in the firm I have already founded	( ) (5a)	( ) (5b)
…foundation of an own firm	( ) (6a)	( ) (6b)
…start as a freelancer	( ) (7a)	( ) (7b)
…foundation of a franchise company	( ) (8a)	( ) (8b)
As successor		
…continuance of my parents'/relatives' firm (family firm)	( ) (9a)	( ) (9b)
…take over a firm not controlled by my family	( ) (10a)	( ) (10b)
Others:		
…no professional career (e.g., travelling, family, etc.)	( ) (11a)	( ) (11b)
…do not know (yet)	( ) (12a)	( ) (12b)
…others	( ) (13a)	( ) (13a)

Question ID: 2.2

Question: How important are the following motives for your future work and career path?

(1=very unimportant, 7=very important)

		1	2	3	4	5	6	7
1	Challenge myself							
2	Realize my own dream							
3	Grow and learn as a person							
4	Earn a larger personal income							
5	Financial security							
6	Build business children can inherit							
7	Continue a family tradition							
8	Follow example of a person I admire							
9	Be innovative, at the forefront of technology							
10	Develop an idea for a product							
11	Achieve something, get recognition							
12	Gain a higher position for myself							
13	Get greater flexibility for personal life							
14	Be my own boss							
15	Realize my own dream							
16	Exploit a specific business opportunity that I recognized							
17	Follow a social mission							
18	Follow an environmental mission							

Question ID: 2.3

Question: 8 Please indicate if and how seriously you have been thinking about founding an own company.

1	Never
2	Sketchily
3	Repeatedly
4	Relatively concrete
5	I have made an explicit decision to found a company
6	I have a concrete time plan when to do the different steps for founding
7	I have already started with the realization
8	I am already self-employed in my own founded firm
9	I have already founded more than one company, and am active in at least one of them

3-7 = intentional founders
8-9 = active founders

Question ID: 2.4

Question: Please indicate your level of agreement with the following statements

Entrepreneur here refers to founding a company, buying one, or succeeding in the parents' company.

(1=strongly disagree, 7=strongly agree)

		1	2	3	4	5	6	7
1	Being an entrepreneur implies more advantages than disadvantages to me.							
2	A career as entrepreneur is attractive for me.							
3	If I had the opportunity and resources, I would become an entrepreneur.							
4	Being an entrepreneur would entail great satisfactions for me.							

IF 3.3 answered with 3-7:

Question ID: 2.5

Question: Which steps have you already undertaken to found your company?

(multiple answers possible)

1	Nothing done so far
2	Thought of first business ideas
3	Formulated business plan
4	Identified market opportunity
5	Looked for potential partners (e.g., fellow students)
6	Purchased equipment
7	Worked on product development
8	Discussed with potential customers
9	Asked financial institutions for funding
10	Decided on date of foundation

IF 3.3 answered with 3-9:

Question ID: 2.6

Question: Where did the idea for this business come from?

(multiple answers possible)

1	Current or former work activity
2	Hobby or recreational pastime
3	University studies
4	Academic, scientific or applied research
5	Idea from self or fellow students
6	Friends outside University
7	Family members

Personal Background questions

Question ID: 3.1

Question: Please indicate in what year you were born

Type: Numerical

Question ID: 3.2

Question: What is your gender?

Type: Radio buttons (male/female)

Question ID: 3.3

Question: What is your nationality?

Type: List (ISO list with all countries of the world)

Question ID: 3.4

Question: Please Select Your Institute:

Type: List or Radio button (UU, IIIT, MIT)

Question ID: 3.5

Question: What is your current level of study?

Type: Checkbox (Undergraduate/Bachelor, Graduate/Master, MBA, PhD, Faculty/Post Doc)

Question ID: 3.6

Question: What program are you following?

Type: Checkbox (available programs and option OTHER)

Question ID: 3.7

Question: How long have you been studying?

Type: Numerical (Years)

IF Question 2.3 answered with 8-9

Question ID: 3.8

Question: Please provide the company website of your (most recently) founded venture

Type: small textbox (optional)

FINAL ANALYSIS

After the survey has been conducted, a report will be created summarizing the data and highlighting interesting results. This report will be send to respondents who opted to receive the results for the survey. After all three surveys have been conducted; the results will be compared, in order to say something about the difference in entrepreneurial attitude over the three universities. The construct 'entrepreneurial attitude' is based on questions 3.1-3.4. Next to that, the evaluation of the different university offerings will be attached to the benchmark overview that will be derived from the case studies.

SPSS OUTPUT

SPSS Output for the T-Test to see whether there are differences in how serious current students have been thinking about founding a company during their studies:

Group Statistics

	Please select your institute/university	N	Mean	Std. Deviation	Std. Error Mean
Please indicate if, and how seriously you have been thinking about founding an own company	International Institute of Information Technology	87	2.89	1.728	.185
	Utrecht University	75	3.53	2.396	.277

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Please indicate if, and how seriously you have been thinking about founding an own company	Equal variances assumed	9.752	.002	-1.993	160	.048	-.648	.325	-1.291	-.006
	Equal variances not assumed			-1.947	132.369	.054	-.648	.333	-1.307	.010

Output for the Chi-Square test to see whether there are differences in career expectations of the two sets of respondents five years after graduation.

Please select your institute/university * [5 years after studies] Which career path do you intend to pursue right after completion of your studies, and which career path 5 years after completion of studies?

Crosstab

			[5 years after studies] Which career path do you intend to pursue right after completion of your studies, and which career path 5 years after completion of studies?									Total
			As employee in a small or medium-sized firm (1-249 employees)	Others	As employee in a large firm (>250 employees)	As employee at a University/in Academia	As employee in public service	As a founder continuing in the firm I have already founded	As a founder starting my own firm	As a freelancer	Do not know (yet)	
Please select your institute/university	International Institute of Information Technology	Count	0	3	14	15	7	4	33	2	9	87
		Expected Count	7.0	1.6	16.6	9.7	3.8	7.0	26.9	1.1	13.4	87.0
		% within Please select your institute/university	0.0%	3.4%	16.1%	17.2%	8.0%	4.6%	37.9%	2.3%	10.3%	100.0%
	Utrecht University	Count	13	0	17	3	0	9	17	0	16	75
		Expected Count	6.0	1.4	14.4	8.3	3.2	6.0	23.1	.9	11.6	75.0
		% within Please select your institute/university	17.3%	0.0%	22.7%	4.0%	0.0%	12.0%	22.7%	0.0%	21.3%	100.0%
Total		Count	13	3	31	18	7	13	50	2	25	162
		Expected Count	13.0	3.0	31.0	18.0	7.0	13.0	50.0	2.0	25.0	162.0
		% within Please select your institute/university	8.0%	1.9%	19.1%	11.1%	4.3%	8.0%	30.9%	1.2%	15.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.633[a]	8	.000
Likelihood Ratio	51.963	8	.000
N of Valid Cases	162		

a. 6 cells (33,3%) have expected count less than 5. The minimum expected count is ,93.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.507	.000
	Cramer's V	.507	.000
N of Valid Cases		162	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Output for the Chi-Square test to see whether there are differences in career expectations of the two sets of respondents immediately after graduation.

Please select your institute/university * [Right after studies] Which career path do you intend to pursue right after

completion of your studies, and which career path 5 years after completion of studies?

Crosstab

			[Right after studies] Which career path do you intend to pursue right after completion of your studies, and which career path 5 years after completion of studies?									Total
			As employee in a small or medium-sized firm (1-249 employees)	Others	As employee in a large firm (>250 employees)	As employee at a University/in Academia	As a founder continuing in the firm I have already founded	As a founder starting my own firm	As a freelancer	No professional career (e.g. traveling, family, etc.)	Do not know (yet)	
Please select your institute/university	International Institute of Information Technology	Count	18	2	50	9	0	4	0	1	3	87
		Expected Count	22.0	1.1	39.2	8.6	3.8	5.9	.5	.5	5.4	87.0
		% within Please select your institute/university	20.7%	2.3%	57.5%	10.3%	0.0%	4.6%	0.0%	1.1%	3.4%	100.0%
	Utrecht University	Count	23	0	23	7	7	7	1	0	7	75
		Expected Count	19.0	.9	33.8	7.4	3.2	5.1	.5	.5	4.6	75.0
		% within Please select your institute/university	30.7%	0.0%	30.7%	9.3%	9.3%	9.3%	1.3%	0.0%	9.3%	100.0%
Total		Count	41	2	73	16	7	11	1	1	10	162
		Expected Count	41.0	2.0	73.0	16.0	7.0	11.0	1.0	1.0	10.0	162.0
		% within Please select your institute/university	25.3%	1.2%	45.1%	9.9%	4.3%	6.8%	0.6%	0.6%	6.2%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.504[a]	8	.003
Likelihood Ratio	27.923	8	.000
N of Valid Cases	162		

a. 9 cells (50,0%) have expected count less than 5. The minimum expected count is ,46.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.381	.003
	Cramer's V	.381	.003
N of Valid Cases		162	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.