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Activities as a proxy for assessing development of entrepreneurial competencies

Business Development in Project ReVibe Energy at Chalmers
School of Entrepreneurship

Master of Science Thesis in the Master Degree Programme,

Entrepreneurship and Business Design

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1. Introduction

1.1 Problem statement

Entrepreneurship is becoming increasingly frequent in educational discussions and entrepreneurial education is seen as a way of developing competencies that are important for an economical sustainable society (Swedish government, 2009; Skolverket, 2013; Rasmussen et al, 2006).

As a response to these discussions the European Union, as well as specific countries, has invested in entrepreneurial education more extensively the past years, in the hope of stimulating a sustainable development. Several countries have developed national strategies on how to integrate entrepreneurship into education, starting in first year's class (Eurydice, 2012). In addition, entrepreneurial educations on a higher academic level have been established during the recent decade (Lackéus & Williams Middleton, in press). These educations focus on developing entrepreneurial competencies mainly through action-based education where the students are given the opportunity to set skills into practice (Rasmussen et al, 2006). However, with the objective to develop entrepreneurial competence, the next question is what type of competence it represents. Even if the definition of entrepreneurial competence is both broad and vague, it can be said that it to a large extent focuses around attitudes and skills such as drive, ability to see opportunities and other attitudinal competencies (Lackéus, 2013a)

With increased investments and as action-based entrepreneurial educations become more common, the need for assessing the learning outcomes is raised (Fayolle et al, 2006). This is not only of interest from a governmental point of view that has to justify educational investments. It is also relevant for the providers of entrepreneurial educations, since they want to prove the outcome of the education in order increase the attractiveness of the education. Even more important is to control the learning outcome as a way to ensure quality (Faxheden, 2014).

However, with the objective to develop entrepreneurial competence, assessing or measuring the learning outcome becomes particularly challenging. This is due to the fact that methods for assessing learning outcomes traditionally have aimed towards evaluating competence of knowledge and, to some extent, skills character. As stated, entrepreneurial competence has a lot to do with developing attitudes that, as for today, are more complex to assess. Without proper methods to assess the learning outcomes, students will undergo entrepreneurship educations and develop entrepreneurial competencies, but the sources from which these competencies are developed are not clearly identified.

With basis of this, new methods assessing entrepreneurial competencies have to be constructed so that development of such competencies can be assessed and secured from an educational point of view. In the article *Developing Entrepreneurial Competencies,* Lackéus (2013a) makes an attempt to this by develop a new type of method that implies looking at events and activities as the source for learning. With the hypothesis that certain events or activities contribute to development of certain entrepreneurial competence,

these activities can be used as a proxy for development of entrepreneurial competencies. If this proxy is accurate, it facilitates for increased control of the learning outcomes and enables for concretization of the actual results from entrepreneurial educations.

This study serves to operationalize this proxy theory into the settings of Chalmers School of Entrepreneurship's project year. By investigating what activities that have lead to development of entrepreneurial competencies, this study will facilitate for validating the correlation between certain activities and certain entrepreneurial competencies. It will also consider the possibility to assess and control such activities from an education provider's perspective.

1.2 Purpose of study

This thesis serves the purpose of testing the proxy theory, which has been developed by Martin Lackéus (2013a), by investigating the correlation between activities and development of entrepreneurial competencies on students that have gone through an action-based entrepreneurial education. The purpose is also to investigate how activities leading to development of entrepreneurial competencies can be assessed from an educational point of view.

1.3 Research questions

To be able to meet the purpose of the study, three research questions have been established:

1. *What activities during an action-based project year lead to the most significant development of entrepreneurial competencies?*
2. *What entrepreneurial competencies are developed from these activities (referring to RQ1)?*
3. *Does the provider of the education assess these activities (referring to RQ1) and, if not, how can they be assessed?*

1.4 Background - Chalmers School of Entrepreneurship's Project year

Entrepreneurship education has previously taught and focused on how to be entrepreneurial. During the last decade, however, the presence of action-oriented elements has increased and the focus has shifted towards more action-based learning in entrepreneurial educations (Rasmussen et al, 2006).

One action-based entrepreneurship education is the Chalmers School of Entrepreneurship in Gothenburg, Sweden. The education is a two-year Master program where the first year is made up by courses of theoretical character while the last year is solely an action-based venture creation project year (hereinafter referred to as the project year). During the project year the students are given the opportunity to run a so-called surrogate-entrepreneurship company (Lundqvist, M. A. 2013). Students are divided into teams of three individuals and given an idea or innovation of technical character to build a company on. During this journey the students are given office spaces and support from teachers and business coaches provided through Encubator AB, a venture capital company fully own by Chalmers. The intention of the project is to build a company where the students can be employed after the project year.

2. Theory

The theory chapter aims to provide a theoretical foundation for the analysis of the interview results. To be able to draw conclusions saying that activities of certain character lead to a certain type of entrepreneurial learning, theory around activity-learning as well as entrepreneurial competence is needed to facilitate this process. Hence the theory chapter starts by outlining the basis of activity-based learning where typical characteristics of activities generating learning are described. This leads to a framework that is adopted in this study. Next step is to define entrepreneurial competence and this is done by adopting another framework developed in several previous studies including Lackéus (2013a), Heinonen & Poikkijoki (2006) and Eurydice (2012). This is finally linked together in the theory from Lackéus (2013a) that suggests actvities as proxy for development of entrepreneurial competencies that is to be operationalized in this study.

2.1 Activity based learning

2.1.1 Characteristics of activities leading to learning

Activity-based learning is often referred to as "learning-by-doing" and means that competencies can be developed through setting them into practice. The soviet psychologist Lev Vygotskij (1896-1934) developed theories around how activities in a social environment can develop and stimulate competencies. He argues that activities leading to learning and development typically are characterized by including the following components:

Social interaction. Development of competencies is derived through interaction with other people. Learning together with other individuals always precedes the individual learning.

Mediating artifacts. In the activities, when doing a task or solving a problem, tools and mental models are used as mediating means to understand and to learn. For instance when learning math, the fingers are used as a medium to understand and learn mental arithmetic.

Activities are situated. Activities that generate learning always take place in a certain context or in specific situations. For instance, it is easier to learn to speak German by being in Germany.

Creativity. Activities that involve creating new boundaries and redefining the situation is another characteristic of an activity that generate learning. Learning is especially facilitated for when people not only get to utilize social interaction, mediating artifacts and situations (the three things mentioned above) but also are able to redefine them (Strandberg, 2006)

2.1.2 Categorization of activities leading to development of entrepreneurial competencies

The theory from Vygotskij has been built upon by many other studies around activity-based learning. One of these, that is focusing on entrepreneurial learning is *The sources and dynamics of emotions in entrepreneurship education learning process* by Arpiainen et al (2013). The authors construct a framework by listing three main themes of activities and three sub-categories within each theme, giving nine types or characters of events:

1. New kind of learning environment
   a. Uncertainty and confusion
   b. Theory versus practice
   c. Support from outside learning environment
2. Collaborative learning
   a. Team work
   b. Time pressure
   c. Individual differences between learners
3. Challenging tasks
   a. Overcoming knowledge and skills gaps
   b. Interacting with the real world
   c. Leadership and managing people

This framework has later been adapted by Lackéus (2013a) where he renames and also adds *Presenting in front of others* to make it ten categories in total. This paper adopts this framework when categorizing activities later on.

1. Uncertainty and ambiguity in learning environment
2. Balancing theory and practice
3. Support from outside learning environment
4. Teamwork environment
5. Time pressure
6. Individual differences between learners
7. Overcoming competency gaps
8. Interaction with outside world
9. Leadership and managing people
10. Presenting in front of others

2.2 Entrepreneurial competence

Entrepreneurial competence is a wide concept and the interpretation of it varies. In order to make the concept more concrete, it can be broken down into a framework consisting of three dimensions through which competencies in general can be described. These dimensions facilitate for describing entrepreneurial competence in particular (Lackéus, 2013a; Heinonen & Poikkijoki, 2006; Eurydice, 2012). The three dimensions are:

- Knowledge
- Skills
- Attitudes

In this paper, this Knowledge, Skills, and Attitudes framework (hereinafter referred to as the KSA framework) is adopted and used to facilitate for further discussions around entrepreneurial competence and entrepreneurial learning. Lackéus (2013a) makes his interpretation of the framework to fit his study in *Developing entrepreneurial competencies*, where he describes how each dimension can be related to entrepreneurial competencies. This is further explained in the table below.

Knowledge sub themes	Interpretation
Mental models	How to get things done without resources, risk and probability models
Declarative knowledge	Basics of accounting, financing, technology, marketing and risk
Self insight	Knowledge of personal fit with an entrepreneurial career

Skills sub themes	Interpretation
Marketing skills	Conducting market research, assessing the marketplace, Marketing products and services, Persuasion, getting people excited about your ideas, Dealing with customers, Communicating a vision
Opportunity skills	Recognizing and acting on business opportunities, Product development skills
Resources skills	Creating a business plan, including a financial plan, Obtaining financing
Interpersonal skills	Leadership, motivating others, Managing people, Listening, Resolving conflict
Learning skills	Active learning, Adapting to new situations, coping with uncertainty
Strategic skills	Setting priorities (goal setting) and focusing on goals, Defining a vision, Developing a strategy, Identifying strategic partners, Risk management

Attitudes sub themes	Interpretation
Entrepreneurial passion	"I want". Need for achievement
Self-efficacy	"I can"
Entrepreneurial identity	"I am / I value". Deep beliefs, role identity, values, axiology
Proactiveness	"I do". Action-oriented, initiator, proactive
Uncertainty/ambiguity tolerance	"I dare". Comfortable with uncertainty and ambiguity, adaptable, open to surprises
Innovativeness	"I create". Novel thoughts / actions, unpredictable, radical change, innovative, visionary, creative, rule breaker
Perseverance	"I overcome".

Table 1 The table shows how entrepreneurial competencies can be described through the Knowledge, Skills and Attitudes. The interpretation of what each competence means has been done by Lackéus (2013a).

2.3 Activities as a proxy for assessing entrepreneurial competence

In the article *Links between Emotions and Learning Outcomes in Entrepreneurial Education* Lackéus (2013b) investigates links between strong emotions and entrepreneurial learning outcomes in an action-based entrepreneurship education program. The article is based upon a study of students enrolled at Chalmers School of Entrepreneurship and their emotional journey during the education to identify what emotions that trigger learning.

The findings show a large number of connections between strong emotional feelings and learning outcome. What Lackéus (2013b) wants is to establish the connection between the certain emotion and the development of entrepreneurial competence to the extent that one can say that emotion x leads to learning y. In the results, some links are more frequent than others and are hence seen as more evident than others. The article is then considering the sources triggering the emotions where three sources of emotion or types of activities (from the list in 2.1.2) are highlighted and seen as the core finding of the study:

- Interaction with outside world
- Uncertainty and ambiguity in learning environment
- Teamwork environment

By looking at the source of emotion, an attempt is made to establish a connection between the source of the emotion, which often include some kind of activity, and the entrepreneurial learning. The result of the study shows that the learning outcome from the three sources of emotion is heavily leaning towards an attitudinal character:

- Formation of entrepreneurial identity   (Attitudes)
- Increased self-efficacy   (Attitudes)
- Increased uncertainty/ambiguity tolerance (Attitudes)
- Increased self-insight   (Knowledge)

In the article *Developing Entrepreneurial competencies* Lackéus (2013a) suggests that entrepreneurial educations can be assessed by measuring (emotional) events. In other words, activities can be used as a proxy for assessing development of entrepreneurial competence. If a certain activity leads to development of a certain competence, the activity can be controlled instead of the actual learning outcome. This is particularly useful when it comes to assessing the outcome of entrepreneurial educations since entrepreneurial competence to a large extent is made up by attitudes that are complex to assess. So instead of looking at the learning outcome, Lackéus (2013a) suggests looking at the activity leading to the learning outcome. This theory is hereinafter referred to as *the proxy theory*.

In this study, emotions as mediating for learning will be disregarded. Instead only the connection between activities and learning will be considered when testing the proxy theory and the result of Lackéus (2013a).

3. Method

The method chapter serves to describe how this study has been done. First the research method is being described, followed by a description of each phase of the workflow. Finally a discussion on how the choice of method has affected the validity and reliability.

3.1 Research design

This study is built upon a qualitative method which is considered suitable when the objective is to create a deep understanding for the subject that is being studied and hence questions like "why" and "how" are posed instead of "when" and "where" (Denzin & Lincoln, 2011). Insider action research (Coghlan, 2007) has also been applied since I have been participating in the environment in which the study has been done. In addition, the fact that my own project was selected to in the data collection contributes to the Insider action research approach. According to Andersen (1998), the choice of research method should be based upon the area that is being studied. Since the research aims to test a theory through empirical data, a qualitative approach was chosen. The phenomenon studied, the correlation between activities and learning, is considered complex and thus a solely quantitative research method is not applicable. Still, however, parts of the study consider quantitative measures in order to draw conclusions from the data collected. The phases of this study are outlined and described below

Theoretical study	Data collection	Interpretation of data	Comparison with theory	Conclusions

Figure 1 The logical workflow of this thesis

3.2 Theoretical study

The first phase of the study was to understand the theory developed by Martin Lackéus (2013a). This phase included scanning of theory in relation to entrepreneurial competence and action-based learning. A crucial part in this step was to establish a definition of the concepts relevant for this study. For instance, the meaning of entrepreneurial competence in this study had to be defined and described. The same was true for what type of activities that generate learning. However, the outcome of Lackéus (2013a) study was treated carefully to avoid the result of that study to bias the interview results of this study.

3.3 Data collection

The data collection was made up by interviews with students enrolled in the project year at Chalmers School of Entrepreneurship.

3.3.1 Interviews

The interviews were conducted during April and May 2014, the last two months of the project year, enabling for reflection over the learning during the year. They were held in person with each of the interviewee and carried out in a semi-structured way in order to create a deeper understanding for the answers (Whiting, 2008). The questions asked during the interview were:

1. What activities have been the most significant for your learning during the venture creation project year?
2. What have you learned from each of these activities?

The students were informed to bring up between four and eight different activities and the corresponding learning. In line with the semi-structured approach, the interviewees were encouraged to elaborate on the learning from each activity. Furthermore clarifying questions were posed as well as follow-up questions to ensure accurate interpretation of the answers.

As a way to enable thoughtful answers the interviewees were informed about the questions approximately one day beforehand. The interviewees were also informed about the background of the study to give the full picture of what the interviews served to investigate. They were also informed about the KSA framework (see 2.2) to ensure that the interviewees were aware of the fact that learning outcomes can fall within all three of the competence dimensions (Knowledge, Skills and Attitudes). In some of the interviews, I gave concrete examples of activities and learning to guide the interviewee in the right direction. It should be said that the interviewees were informed that the learning outcome was not being restricted to entrepreneurial competencies, but could be competencies in general.

3.3.2 Choice of interviewees

The interviewees for this study are all students currently enrolled at Chalmers School of Entrepreneurship's project year. The selection of interviewees were delimited to this setting but were further selected through applying an extreme sample method (Patton, 2005) meaning that the interviewees are part of project teams from the two most successful and least successful teams. In this case I have defined success as how well the original idea provided has been managed and thus the two most successful teams are the ones who have been initiating sales during the time scope for the project (Agro Paper and ReVibe Energy). The two teams that have chosen to dismiss the idea that was initially provided to the venture creation project are considered the least successful (Microstructures In Paint and Pine Innovation). This resulted in twelve interviews, and the fact that I was interviewing myself since I was part of the ReVibe Energy. This selection method was chosen in order to increase the reliability of the results by taking the variety of the projects into consideration.

Project	Number of interviewees
Agro Paper	3
ReVibe Energy	3
Microstructures In Paint	3
Pine Innovation	3

Table 2 The table is showing the selection of interviewees; their project belonging and the number of interviewees in each project

3.4 Interpretation of data

The results from the interviews were then interpreted in two ways. The activities mentioned by the interviewees were categorized according to the framework described in the theory section 2.1.2. The learning generated from the activities was then categorized according to the KSA framework for entrepreneurial competencies describes in theory section 2.2.

3.5 Comparing data with theory

The categorization of activities and entrepreneurial learning facilitated for establishing relations between the activities and the development of certain entrepreneurial competencies. Through creating these relations I was able to compare these connections between activities and learning to Lackéus (2013a). It also enabled for further analysis of how activities can be assessed from an educational point of view.

3.6 Methodology discussion

The methodology of this study does impact the reliability and the validity of the study, thus impacting the generalization of the findings. This discussion will highlight some of the critical aspects of the methodology, their implications and how these were approached.

3.6.1 Theory

The theory developed by Lackéus (2013a) has limitations that affect this study as well. These limitations are similar to those in this study. A relatively small number of interviewees, subjective coding of data and the unknown transferability of the findings to other contexts are some of the limitations brought up by Lackéus (2013a) himself. One other important aspect that is crucial for this study is the fact that the theory that activities can be used as a proxy for assessing entrepreneurial learning outcomes has not been tested before. In other words it is still uncertain whether the theory is useful or not. However, this study is a first attempt to set it into practice, which shall be kept in mind when considering the result of this study.

3.6.2 Interviews

The choice of explaining the purpose of the study, providing instructions for the interview and giving examples of activities and learning are three aspects that risk generating biased data. When giving examples of what I have learned from which activities it is easy to put the words in the interviewee's mouth and hence hinder unbiased answers. I managed that

problem by giving two types of examples; one very broad and general example of an activity with corresponding learning and one very specific activity and learning from my own project, which was unique for my own project.

The fact that the answers provided are subjective is difficult to avoid. As long as the questions were posed to the subjects of the study, the perceived activities and the perceived learning will be the outcome. However, there is a risk of receiving answers with low reliability by not getting thought through answers, meaning that the interviewees don't know their own perception at the time of the interview. To manage this risk I did inform each of the interviewees beforehand by telling what questions I would pose. By doing so the interviewees were given the chance to initiate the thought process and hence increase the chances that no important activity would be missed.

The fact that I interviewed myself also has to be taken into consideration from a reliability point of view. There is of course a risk of providing biased answers as a way of designing the end result in a desirable way. To avoid this risk I started by interviewing myself, before interviewing the rest of the interviewees so that their answers would not affect mine.

3.6.3 Analysis
The interpretation of the data, which included a categorization in accordance to the description in 3.2.2, was based on my own arbitrary understanding and interpretation of the categories. There is a risk of misinterpreting the meaning of each category, which would lead to decreased validity and faulty conclusions in the end. However, one can argue that I have enough understanding for the environment in which the interviewees act and therefore I would be suitable for making the interpretation. Still, it is a risk that can be reduced by gaining deeper understanding for how the categories have been generated as well as letting the categorization be made by several individuals independently.

4. Results

This chapter presents the outcome of the interviews. The first section considers the activities brought up during the interviews where the most frequent activities are being further categorized into different themes found in each activity. The second part of the result chapter presents the learning developed from the activities mentioned during the interviews. In a similar way, these are categorized in accordance to the KSA framework (described in the theory chapter 2.2) into different types of competencies developed through the activities. Finally, the categories of activities and the categories of entrepreneurial competencies are put together in order to test how these correlate with the proxy theory.

4.1 Activities

The interview results generated a large number of activities that during the project year at Chalmers School of Entrepreneurship have lead to, what the interviewees perceive as, learning. The activities listed are of different character, both with respect to the time frame of the activity and the type of activity. For instance, working in the same team for prolonged time is an activity not as distinctive with respect to duration, as for instance making an initial telephone call to potential customer. In the same way the type of activity varies between a customer meeting and recruiting external competence, for instance. The school deliberately facilitates some of the activities while some activities are the result of a more randomized process in relation to the specific projects.

4.1.2 Activities mentioned during the interviews

The activities that were brought up during the interviews are listed in Table 3 below.

Work in the same group for prolonged time	Role play lecture
Meetings with customers in early phase	Board meetings
Customer meetings	Making Scenario planning
Presentation training	Internal meetings
School presentations	Being in charge of a company/Being in the driver's seat
Customer presentations	Being in charge of a (price strategy) workshop
Investor presentation	Doing assignments that he/she does not like
Search for funding	When they realized the production price was much higher than expected
Taking major decisions	
Incorporate the project	Conflict with group member
Making cold calls	When group member decided not to continue
Meetings with idea provider	Preparation before external meetings
Theoretical lectures	Making the first sale
Programming	Manage meetings
Being initiated to a new industry	First board meeting
Having the role as business expert in a team	Internal kick-off where group norms were set
Making academic deliverables with Pass/Fail grade	Having a constant dialogue with fellow students
Ownership negotiations between board and students	Meeting where the future of the project was decided
Networking events with potential investors	Trying to get in touch with the right people
Recruiting Master thesis students	Receiving financing
Managing two Master thesis students	

Table 3 The table shows a list of all the activities that were mentioned during the interviews as significant in developing entrepreneurial competencies

4.1.2 Activities considered most significant

Some of the activities shown in Table 3 have been recurrently mentioned by different interviewees. These are the activities that will be considered in the continuing categorization and in the analysis. The table below shows these activities and the number of interviews where each activity has been mentioned.

Activity	Frequency
Work in the same group for prolonged time	7
Meetings with customers in early phase	7
Presentation training	4
School presentations	3
Customer presentations	3
Search for funding	3
Making cold calls	3
Taking major decisions	2
Managing master thesis students	2
Investor presentations	2
Meeting with idea provider	2
Customer meetings (not in early phase)	2

Table 4 The table shows the activities that have been mentioned by more than two interviewees. The right column shows the frequency, i.e. the number of interviewees where the activity has been mentioned

4.1.3 Categorization of the activities

The twelve activities selected in Table 4 can be categorized in accordance to the framework presented in theory section 2.1.2. It should be said that an activity could be of more than one type or character, which is true for some of the activities in the table below. This categorization has been arbitrary made by the author based on the description from the interviewees of each activity. The majority of the activities involve elements from all of the categories, however the selection of what activity that belongs to which category has been restrictive in order to establish a contrast between activities that are different in their nature. This was primarily made to not end up with the scenario that all activities fit in all categories.

Activity	Individual differences between learners	Balancing Theory and Practice	Teamwork environment	Uncertain and ambiguity in learning environment	Interaction with outside world	Leadership and managing people	Overcoming competency gaps	Time pressure	Support from outside of learning environment	Presenting in front of others
Work in the same group for prolonged time			■							
Meetings with customers in early phase					■					
Presentation training										■
School presentations										■
Customer presentations					■					■
Search for funding										
Making cold calls				■						
Taking major decisions				■						
Managing master thesis students						■				
Investor presentations					■					■
Meeting with idea provider										
Customer meetings (not in early phase)					■					
Number of activities	0	0	1	2	5	1	0	0	0	4

Table 5 The table shows a categorization of the activities according to the framework on different types of activities developed by Aripainen et al (2006).

4.2 Entrepreneurial competencies generated from activities

As the interviews were structured, the interviewees were to describe what they have learnt from each of the activities. In this section, the learning will be described in Table 6 and further categorized according to the KSA framework in Table 7.

Activity	Learning
Work in the same group for prolonged time	Increased understanding for other individuals, Conflict resolution, Knowledge on how to build a well functioning group climate, Improved organization skill, Leading others, Being lead by others, Clearer perception of own strengths and weaknesses, Increased confidence, Improved ability to identify others' needs, Increased self insight and awareness in group dynamics, Improved decision making skill
Meetings with customers in early phase	Knowledge on the certain company and its industry, Improved ability to quickly understand the overall concept of new industries and situations, Knowledge on meeting techniques, Improved ability to identify customer needs and opportunities, Improved ability to "think on your feet", Better at utilizing other people's competence to get things done, Increased self control, Ability to determine when to listen and when to talk, Better at reaching the desired objective of the meeting, Increased confidence in having the initiative during a meeting, Increased confidence in handling expectations, Acquired a feeling that he/she can add value to the customer
Presentation training	Increased confidence in presenting in front of others, Knowledge on how to suit the message to fit the audience/purpose, Overall improvement of presentation performance skills, Knowledge on how to build a presentation, Better at taking others' input/critics into consideration, Knowledge on how to use non-verbal communication when presenting
School presentations	Increased confidence in presenting in front of others, Improved presentation technique
Customer presentations	Improved presentations technique (including body language and performance in general), Knowledge on how to build a selling presentation, Increased confidence in presenting to others, Improved ability to convey a message
Search for funding	Knowledge on which alternatives there are to finance a start-up
Making cold calls	Increased confidence in speaking to strangers, "I am not afraid to the outside world anymore", Improved communication skill in terms of using few words to convey a message, Improved ability to reach the desired outcome of the conversation, Increased confidence in responding to questions
Taking major decisions	Increased confidence in taking decisions without sufficient information, Knowledge on how to present subjective feelings in an objective way, Insight that taking the wrong decision is not the end of the world – instead it can be a step forward, Acquired a toolbox of methods to create foundation for decisions, Improved ability to foresee when a decision has to be made, Less afraid of making decisions
Managing master thesis students	Improved leadership, Increased confidence in leading people who are more competent within the certain area, Increased confidence in setting expectations to reach desired objectives
Investor presentations	Improved ability to handle stress, Knowledge on how to prepare in order to facilitate for a really good performance
Meeting with idea provider	Knowledge on the certain technology and how the industry works in reality, Learned how to interpret business theory to reality, Strengthened identity as entrepreneur, Improved ability to organize the work that has to be done and to design the road to the desired goals of the project, Improved ability to identify what has to be done
Customer meetings (not in early phase)	Increased understanding for others' problem, Increased self confidence in the interaction with other people, Less afraid for making mistakes, Reduced respect to the seriousness of customer meetings, Acquired the feeling that I am capable of having customer meetings, Learned how and when to listen and to pose relevant questions, Learned how to handle both positive and negative feedback (stay at the ground when receiving positive feedback and not being depressed when receiving negative feedback)

Table 6 The table presents a description of all learning generated from the activities

The learning outcome from the activities presented in the table above can be categorized according to the KSA framework on entrepreneurial competence. The table below shows what type of entrepreneurial competencies that are developed from each of the twelve activities. The bolded competencies are the ones that have been mentioned independently by he majority of the interviewees who have chosen the particular activity. For instance, if three interviewees selected *Presentation training* and two of them claimed that their *Marketing skill* was improved, *Marketing skill* will be bolded.

Activity	Knowledge	Skills	Attitudes
Work in the same group for prolonged time	**Self insight**	**Interpersonal skills**	Self-efficacy Entrepreneurial identity
Meetings with customers in early phase	Declarative knowledge Self insight	Marketing skills Learning skills Interpersonal skills **Opportunity skills**	**Uncertainty/ambiguity tolerance** **Self-efficacy** Perseverance Innovativeness
Presentation training	Declarative knowledge	**Marketing skills**	Self-efficacy
School presentations	Mental models	**Marketing skills**	**Self-efficacy** Proactiveness Perseverance
Customer presentations	Mental models	**Marketing skills**	**Self-efficacy** **Uncertainty/ambiguity tolerance**
Search for funding	**Declarative knowledge**	**Resource skills**	
Making cold calls	Mental models	Strategic skills Interpersonal skills Marketing skills	**Self-efficacy** **Uncertainty/ambiguity tolerance**
Taking major decisions	**Mental models**	**Strategic skills**	**Uncertainty/ambiguity tolerance**
Managing master thesis students		**Interpersonal skills**	Uncertainty/ambiguity tolerance
Investor presentations	Declarative knowledge Mental models	**Marketing skills**	**Entrepreneurial passion** **Self-efficacy** Proactiveness Innovativeness
Meeting with idea provider	Self insight Declarative knowledge	**Learning skills**	Entrepreneurial identity
Customer meetings (not in early phase)	**Declarative knowledge**	**Learning skills** Interpersonal skills	**Self-efficacy** Uncertainty/ambiguity tolerance

Table 7 The table presents what type of entrepreneurial competencies that are developed from each activity in accordance to the KSA framework presented in the theory chapter.

4.3 Relationship between Activities and the development of entrepreneurial competence

In this section, the categorization of the activities and the categorization of the learning are tied together, in the same way as Lackéus (2013a) does. The competencies marked with bolded text are considered most significant.

4.3.1 Competencies developed from Teamwork environment

The activity *Work in the same group for prolonged time* can be considered to fit in *Teamwork environment* category. According to Table 7 the following competencies are developed through such activities:

Self insight (Knowledge), **Interpersonal skills** (Skills), Self-efficacy (Attitudes), Entrepreneurial identity (Attitudes)

4.3.2 Competencies developed from Uncertainty and ambiguity in learning environment

The activities *Making cold calls* and *Taking major decisions* can be considered to fit in *Uncertainty and ambiguity in learning environment*. According to Table 7 the following competencies are developed through such activities:

Mental models (Knowledge), **Strategic skills** (Skills), Interpersonal skills (Skills), Marketing skills (Skills), **Self-efficacy** (Attitudes), **Uncertainty and ambiguity tolerance** (Attitudes)

4.3.3 Competencies developed from Interaction with outside world

The activities *Meetings with customer in early phase, Customer presentations, Making cold calls, Investor presentations and Customer meetings (not in early phase)* can be considered to fit in *Interaction with outside world*. According to Table 7 the following competencies are developed through such activities:

Declarative knowledge (Knowledge), Self insight (Knowledge), Mental models (Knowledge), **Marketing skills** (Skills), **Learning skills** (Skills), Interpersonal skills (Skills), **Opportunity skills** (Skills), Strategic skills (Skills), **Uncertainty/ambiguity tolerance** (Attitudes), **Self-efficacy** (Attitudes), Perseverance (Attitudes), Innovativeness (Attitudes), **Entrepreneurial passion** (Attitudes), Proactiveness (Attitudes)

4.3.4 Competencies developed from Leadership and managing people

The activities *Managing master thesis students* can be considered to fit in *Leadership and managing people*. According to Table 7 the following competencies are developed through such activities:

Interpersonal skills (Skills), Uncertainty/ambiguity tolerance (Attitudes)

4.3.5 Competencies developed from Presenting in front of others

The activities *Presentation training, School presentations, Customer presentations* and *Investor presentations* can be considered to fit in *Presenting in front of others*. According to Table 7 the following competencies are developed through such activities:

Declarative knowledge (Knowledge), Mental models (Knowledge), **Marketing skills** (Skills), **Self-efficacy** (Attitudes), Proactiveness (Attitudes), Perseverance (Attitudes), **Uncertainty/ambiguity tolerance** (Attitudes), **Entrepreneurial passion** (Attitudes), Innovativeness (Attitudes)

4.3.6 Competencies developed from Individual differences, Balancing theory and practice, Overcoming competency gaps, Support from outside learning environment and Time pressure

None of the twelve activities that have been mentioned more than two times are stemming from *Individual differences, Balancing theory and practice, Overcoming competency gaps, Support from outside learning environment* or *Time pressure*. Some of the less recurring activities in Table 3 stem from these types, but they are not to consider in this analysis.

5. Analysis

This chapter serves to analyze the results to meet the purpose of this thesis. The first part will put the results in comparison to the proxy theory and present how the result conforms to the theory, along with insights from the comparison. The second part discusses the possibility to assess the activities from an educational point of view.

5.1 The results in relation to the proxy theory

Lackéus (2013a) showed significant correlation between certain types of activities and development of certain entrepreneurial competencies. The most significant correlations, which are considered the main findings of his study, are:

Interaction with outside world → Increased self-efficacy

Uncertainty and ambiguity in learning environment → Increased uncertainty and ambiguity tolerance

Teamwork environment → Increased self insight

These correlations can be found in the results from this study as well. When considering the learning from activities characterized by *Interaction with outside world*, *Increased self-efficacy* is one of the learning that is most emphasized by the students. The same goes for *Uncertainty and ambiguity in learning environment* and *Teamwork environment* where *Increased uncertainty and ambiguity tolerance* as well as *Increased self insight* can be found among the learning from that types of activities. In that sense, the result of this study confirms the findings from Lackéus (2013a). It also strengthens the theory of seeing activities of these kinds as proxies for development of that type of entrepreneurial competence, meaning that one, to some extent, can rely on the fact that performing these types of activities lead to development of that type of desired learning.

However, even if Lackéus (2013a) findings are confirmed in this study, the result revealed several other interesting correlations that challenge and complement the findings from Lackéus (2013a). These are presented in following sections.

5.1.2 Activities involving *Presenting in front of others* significantly develop entrepreneurial competencies

Of the twelve activities that have been most frequently mentioned by the interviewees, *Presenting in front of others* is the type that characterizes the second highest number of activities (4 activities, see Table 5). Activities of such character have primarily developed attitudinal competencies in terms of *Increased self-efficacy, Increased uncertainty and ambiguity tolerance* and *Entrepreneurial passion* combined with *Improved Marketing skills.* This is in contrast to Lackéus (2013a) that doesn't mention this type of activities as a key activity for development of entrepreneurial competencies. One reason for that may be that these activities have been considered separately in this study, meaning that Customer

presentations, Investor presentation and School presentations have been treated as different types of events. One can argue that they in fact are similar enough to be treated as one activity. The rationale behind the separation, however, is the variety in settings in terms of audience and what were at stake between these types of presentations, which were carefully emphasized by the interviewees.

5.1.3 Competencies developed from the most frequent specific activities
It is interesting to consider the most recurring activities according to Table 4:

1. *Work in the same group for prolonged time*
2. *Early phase customer meetings*
3. *Presentation training*

The entrepreneurial competencies developed from these activities are primarily the following:

- *Increased Self insight*   (Knowledge)
- *Interpersonal skills*   (Skills)
- *Opportunity skills*   (Skills)
- *Marketing skills*   (Skills)
- *Increased Self-efficacy*   (Attitudes)
- *Increased Uncertainty/ambiguity tolerance* (Attitudes)

That would imply that these are the most common and most important learning outcome from the project year at Chalmers School of Entrepreneurship. Noteworthy is that the three most significant competencies from Lackéus (2013a) study (*Increased self insight, Increased Self-efficacy* and *Increased Uncertainty/ambiguity tolerance*) are found among them.

5.1.4 Activities involving *Interaction with outside world* are most important for developing entrepreneurial competence
Of the twelve activities that have been listed previously, five of them involve *Interaction with outside world*, thus making that characteristics the most common. Fact is that nearly half of the activities that significantly lead to development of entrepreneurial competencies involve interacting with people outside of the school environment. That tells stepping outside of the school environment to meet with customers and other external people is crucial for the educational experience that Chalmers School of Entrepreneurship facilitates. In other words, the most important environment for developing entrepreneurial competencies exists outside the school's boarders of control. From an educational point of view and with this insight in mind, an important, if not the most important, role for the school is to facilitate for students to interact with external actors.

5.1.5 The importance of having value at stake in activities
Do these activities lead to development of the entrepreneurial competencies in the sense that it is only about performing them and nothing about the circumstances? Lackéus

(2013a) argues for the importance of, what he refers to as, value creation when it comes to development of entrepreneurial competencies. Value creation implies not only creating value for you but creating value for external stakeholders, i.e. outside the educational environment, too. That perspective lifts the question whether the need for value creation elements in the activities mentioned is of importance in order to develop entrepreneurial competencies. Considering *Investor presentation*, for instance. There is an obvious difference in standing in front of a number of potential investors trying to convince them to invest in something that you have been working on day and night for years, than standing in front of them presenting something without relevance, where nothing is at stake. If applying this thinking on each of the twelve activities that has been analyzed, the difference in having something at stake is decisive, best illustrated in *Taking major decisions*.

There has been value at stake in the activities for the interviewees, through the setup of the Chalmers School of Entrepreneurship, which is proved since the activities in fact have developed entrepreneurial competencies. But the implication is that having value at stake in the activities is crucial for developing entrepreneurial competencies and thus activities cannot be treated separately. An activity as a proxy for developing entrepreneurial competence is only valid if value is at stake.

5.2 From a school point of view

Learning outcomes are assessed by the Chalmers School of Entrepreneurship's Project year based on the stated learning outcomes in the Course PM presented in Appendix A. A majority of these fall within the Skills or Attitudes dimensions when translating these learning outcomes to the KSA framework. These are to be assessed through, so called, modules that are mandatory elements in the education, together with the learning environment that is provided through the venture creation projects. The modules vary in their character, but they most often involve a lecture followed by a deliverable on the certain subject.

In this thesis the term assess serves to describe how the school deliberately and directly ensures that every student performs the activity and that he or she will acquire the corresponding learning outcome. On an aggregated level, assessment has the meaning of knowing what the learning outcome from the education is and from which activities it is developed. The pedagogy in using modules that correspond to specific learning outcomes can be considered to be a way of practicing Lackéus (2013a) theory since it aims to use specific activities to obtain corresponding learning. However, some of the learning outcomes in Appendix A are more indirectly reached through the setting and learning environment that is provided in through the venture creation process (Faxheden, 2014).

5.2.1 Assessment of the activities

Considering the twelve activities that have been analyzed, some of these can be found in the modules and the activities that are deliberately and directly provided by the school while some are not. It is interesting and important to see how these activities, that according to the interviewees are very valuable for their development of entrepreneurial

competencies, are assessed. Even more important is to see how activities that are not currently assessed in this meaning potentially can be assessed. Table 8 shows how and to what extent the school has assessed each activity during the time frame for this study (2013/2014).

Activity	Assessed/Not assess by the school	How?	Comment
Work in the same group for prolonged time	Assessed	Students are to work in the same group	The group process is not controlled, but the environment is created and facilitated though group talks twice each semester for instance
Meetings with customers in early phase	Not Assessed	-	-
Presentation training	Partially Assessed	Through mandatory lectures/seminars around presentation techniques. Not all students are given training during these sessions though.	Some groups have arranged practice sessions together with their business coach (provided by the school)
School presentations	Assessed	Though mandatory and regular presentations during the project year	These occasions have been group wise presentations and not every student have been forced to present
Customer presentations	Not Assessed	-	-
Search for funding	Not Assessed	-	-
Making cold calls	Assessed	Mandatory individual assignment based on phone calls to unknown customers	The assignment requires the students to book a certain number of meetings through phone calls. It also includes reflection around these phone calls
Taking major decisions	Not Assessed	-	-
Managing master thesis students	Not Assessed	-	-
Investor presentations	Not Assessed	-	-
Meeting with idea provider	Assessed	Arranged meetings	The business coach arranges regular meetings with idea provider
Customer meetings (not in early phase)	Not Assessed	-	-

Table 8 The table shows if and how the school assesses the activities.

As shown in Table 8 seven out of twelve activities are not assessed by the school today, meaning that these activities are a result of the path of the project and not deliberately put in the hands of the students. One can argue that every project is likely to end up in these situations as a result of the environment or the setting that the project year at Chalmers School of Entrepreneurship implies. Still, when considering the strict control of these activities, the destiny of the majority of the most important events for development of entrepreneurial competencies are in the hands of the students.

Regarding the activities that are not being controlled, some of them can be seen as mandatory elements in building a company. For instance, *Customer meetings in early phase, Customer presentations* and *Customer meetings (not in early stage)* have the common ground in customer interaction. Such external interaction has been a crucial part of each project even if the nature of the customer has varied.

The activities *Search for funding* and *Investor presentations* naturally occur if a project decides to continue and if funding is not secured beforehand, through the idea provider for instance. Considering the project year of 2013/2014 this has been the case for the majority of the projects. Furthermore, if a project will experience activities involving *Taking major decisions* and *Managing Master thesis students* is highly dependent on the unique path of each project.

5.2.2 Possibility to assess activities that are not currently assessed

As described in the last section, the characters of the activities that are not being assessed vary and some of the activities are not relevant for all projects, while others are crucial in basically every project. The fact that some activities are only relevant for some projects impacts the school's possibility to assess the activities in a negative way, at least in the sense of making activities mandatory. If assuming that making an activity mandatory would increase the control of it, it would be easier to do so with activities that all projects will go through and benefit from regardless of the nature of the project.

In addition, depending on the character of the activity, the meaning of control changes. So does the possibility to control it. If we look at the activities that involve *Interaction with outside world* or more specifically customer interaction, they to some extent fall outside the school's area of control. Probably, it would be both complex and disadvantageous to follow the projects' external interactions, for instance by participating on customer meetings. So how can *Interaction with outside world* be controlled? One attempt to do this is the activity referred to as *Making cold calls.* It is a mandatory assignment where the students individually are to make a certain number of phone calls to previously unknown customers or other relevant external people. The task is to book three physical meetings that have to be of value for the project. As part of the assignment, the students shall reflect around the conversations and their perceptions of the cold calls. The examination of the assignment involves both a written report but also an oral presentation to the fellow students.

Considering the assessment of this activity, the checkpoint doesn't lie in the external interaction as such, but in making the phone calls a mandatory assignment as well as requiring the students to hand in and present reflections around the activity. That kind of control avoids the problems mentioned with controlling activities outside the school environment. Still, it does the job of ensuring that all students gain the learning that comes from making cold calls. A similar approach appears applicable in other activities that involve interaction with outside world. For instance, customer meetings could easily fit in as an extension of the cold calls assignment. This reasoning builds upon the theory or method of using activities as a proxy for learning and is an excellent example for how this proxy theory can be set into practice.

When it comes to activities unique for each project, practicing control by making activities mandatory is not equally suitable. One way of achieving the same thing is by encouraging the projects to perform valuable activities. If teachers and business coaches would know what activities that lead to certain entrepreneurial learning, it would be easier to encourage specific activities and to create a customized road map for each project. For instance, a project that would benefit from employing master thesis students could be encouraged from the school to do so, with the knowledge of what type of competencies that it typically develops. In that sense, one can argue that the best way from an educational point of view is take this approach to its extreme by dictating how the projects shall progress and what activities each project should undergo. On the other hand, increased control in this sense might reduce some important ingredients, such as freedom and perceived ownership that appeal to the value creation and contribute to raising the stakes in the activities in accordance to the reasoning in 5.1.5.

6. Conclusions

This chapter will conclude the takeaways from this study and give recommendations on how activities of importance can be assessed.

By applying the proxy theory on students that have gone through an action-based entrepreneurship education, some interesting insights have been revealed. Activities involving *Teamwork environment, Uncertainty and ambiguity in learning environment, Interaction with outside world, Leadership and managing people* and *Presenting in front of others* are proved to be the most important elements for developing entrepreneurial competencies. The most emphasized entrepreneurial competencies developed through these types of activities are *Self insight* (Knowledge), *Mental models* (Knowledge), *Declarative knowledge* (Knowledge) *Interpersonal skills* (Skills), *Strategic skills* (Skills), *Marketing skills* (Skills), *Learning skills* (Skills), *Opportunity skills* (Skills), *Self-efficacy* (Attitudes), *Uncertainty/ambiguity tolerance* (Attitudes) and *Entrepreneurial passion* (Attitudes). Activities involving *Interaction with outside world* and *Presenting in front of others* represent the majority of these competencies, making activities of such character the most important for developing entrepreneurial competencies.

The core findings made by Lackéus (2013a) are the correlations between:

Interaction with outside world → Increased self-efficacy

Uncertainty and ambiguity in learning environment → Increased uncertainty and ambiguity tolerance

Teamwork environment → Increased self insight

These correlations are all found in this study too and hence strengthen Lackéus (2013a) findings. However, activities involving *Presenting in front of others* is not highlighted by Lackéus (2013a) and is thereby in contrast to this study.

The theory of using activities as a proxy for development of entrepreneurial competencies is considered strengthened through this study. However, the correlation between certain activities and certain entrepreneurial competencies doesn't imply that activities can be separated from its context. The importance of performing the activities with value at stake is a crucial aspect, emphasized by Lackéus (2013a). In this study this is best illustrated in activities involving *Investor presentations* and *Taking major decisions*.

From an education point of view, the proxy theory is offering a new method for assessing learning outcomes in general and development of entrepreneurial competencies in particular. This is addressing the challenges in measuring competence of attitudinal character. Considering the most important activities, seven of twelve are currently not assessed by Chalmers School of Entrepreneurship. These are to a large extent made up by activities involving *Interaction with outside world,* making the most important type of activities not assessed. This can however be addressed by applying the proxy method, which is exemplified in the activity referred to as *Making cold calls*. This approach can be

practiced in other activities of the same kind and thereby increase the assessment and control of the learning outcomes.

For activities where the relevance of it depend on the unique path of each project, the proxy theory can be applied by encouraging the projects to perform activities leading to entrepreneurial competencies that the particular project would benefit from. There is however a trade-off between the school's control of the projects and the students' sense of ownership, which is crucial for raising the stakes of the activities.

7. Implications

The implications of this study for both further research and for assessment in entrepreneurial educations are described in this chapter.

7.1 Implications for research

This study has both confirmed parts of the research available on the topic, but also complemented with new insights on what type of activities that lead to development to entrepreneurial competencies. Further research is recommended to make a similar study on alumni students, to see how the perception of what activities that lead to development of entrepreneurial competencies change over time. In the same way, research would benefit from testing the theory on other entrepreneurial educations. By broadening research on this topic in these ways would validate the proxy theory further.

7.2 Implications for education

From an educational point of view this study has revealed deficient assessment of important activities for development of entrepreneurial competencies. It has also suggested methods that can act as role models for improving assessment of these activities. Hence this study has strengthened the credibility in the proxy theory as a method to overcome some of the challenges that assessment of learning outcomes in action-based entrepreneurial educations are facing.

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Appendix A

Learning Outcomes (translated to MPBDP from Chalmers curricula)

1. Considerably more in-depth knowledge of innovation venture creation, including deeper insight into current research and development work.

2. Deeper knowledge of methods in communicating and substantiate value.

3. A capability to contribute to research and development (R&D) work.

4. The capability to use a holistic view to critically, independently and creatively identify, formulate and deal with complex issues.

5. The capability to plan and use adequate methods to conduct qualified tasks in given frameworks and to evaluate this work.

6. The capability to create, analyze and critically evaluate different technical solutions.

7. The capability to critically and systematically integrate knowledge.

8. The capability to clearly present and discuss the findings as well as the knowledge and arguments that form the basis for these findings in written and spoken English.

9. The capability to identify the issues that must be addressed within the framework of the specific thesis in order to take into consideration all relevant dimensions of sustainable development.

10. A consciousness of the ethical aspects of research and development work.