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DEMOLA OULU - OPEN INNOVATION PLATFORM FOSTERING STUDENTS’ CREATIVE CONFIDENCE

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Abstract

This master thesis investigates changes that occur in students’ creative confidence when they participate in an open innovation project through Demola Oulu. Demola is here addressed as an open innovation platform that enables students to participate in companies’ product development processes within interdisciplinary teams. During a Demola project, students gain experience in brainstorming and validating their ideas. Through the research data gathered by two surveys, three semi-structured interviews, and field research, this study sheds light on a scarcely researched area of universities as gainers of open innovation. In addition, the thesis builds a connection between open innovation and the psychological concept of creative self-efficacy.

The results of this master thesis indicate that opportunity to practice creativity hands-on during the Demola project fosters students’ trust in their creative skills. In addition, social interaction with Demola’s facilitators and the company partners was discovered to strengthen creative confidence if the communication was oriented by trust and encouragement. Thirdly, students gained more trust in themselves as creative actors when the value of their product demo was acknowledged by the company partner or Demola staff. These findings of the research offer practical help for Demola organization as they tell how the Demola project’s positive effect to students’ creative confidence can be optimized.

Keywords: creative self-efficacy, creativity, university students,
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1 INTRODUCTION

1.1 Introduction of the topic

In the field of business creativity appears in a form of innovation (Kelley & Kelley 2013: 3). When aiming towards innovation one must use his or her creative abilities in order to create something new and valuable. This unique or novel device, method, composition or process is referred as an invention (Wikipedia contributors 2016). And when an invention is taken to market it becomes an innovation (Brown 2003: ix).

A great emphasis is placed on innovation and its crucial role in the growth of material welfare (Benkler 2006: 467). From a company point of view innovation creates competitive advantages and drives success. Through the achieved growth and productivity benefits of innovation spread out to the whole society in terms of increased welfare. Innovation is thus seen so crucial to the Finnish society that it is fostered also by public funds. Finland is described to be drawn by innovation. (Ministry of employment and the economy 2015). In the latest curriculum reform of Finnish pre-primary and basic education teaching of artistic subjects was promoted in order to build precondition for innovative climate in Finland (Ministry of education and culture 2010). Thus it seems that the need for creativity in Finland has been recognized. However there is more to aim for.

In order to make the most of their creativity people need to trust in their abilities of using it. Linda Liukas has described the needed level of the ambition aptly by stating that when students come to school in the morning in Stanford University they are asked whether they are going to establish Facebook or Google (Eskonen 2015). In order to achieve such high goals people need to believe that by using their creativity they are able to bring something new into existence and even able to change the world in their own scale. This strong trust in one’s personal creative abilities is called creative confidence. (Kelley & Kelley 2013: 1–3).

The aim of this master thesis is to examine how activity in an open innovation platform Demola affects students’ creative confidence. Research findings indicate that students trust into their creative abilities increased during the Demola project. This
increasement was achieved through ability to concretely take part into creative innovation practises such as brainstorming. In addition trust and wisely formed feedback in social interaction with business partners and Demola facilitators fostered the change. Through received feedback students recognized the value of their ideas and gained more trust into their creative abilities.

Key elements of the research are innovation activities in an open innovation platform Demola and the concept of creative confidence. Next I will shortly familiarize the reader with both of these concepts.

1.2 Demola open innovation platform

In the center of my research lies Demola Oulu which is an open innovation environment connecting companies, universities and interdisciplinary student groups. As its main activity Demola organizes projects where a student group is addressed with a nascent concept or an idea of a company partner. The student group further develops and tests the concept with the help of Demola facilitators. During the project students gain experience in brainstorming, innovating, validating their ideas and pitching them to audience. As an end product the student group creates a practical demo or prototype which the company may choose to license if it so wishes. Alternatively the student group is able to utilize the created prototype themselves for example by establishing a start-up around it (Kutvonen & Havukainen 2011).

Demola represents an open innovation system where development of new products is done in co-operation with different actors. During the last decades there has been growing interest in this kind of co-operative innovation. It is argued to be replacing a traditional way of product development referred to as closed innovation where company research and development projects are kept inside its borders (Chesbrough 2003: xx–xxii).

In this master thesis I approach open innovation from a fresh point of view by focusing on the benefits that university students gain through participation into Demola’s open innovation activities. Consequently the standpoint is public sector, student and
individual centered. I examine the changes in students’ trust into their creativity and ability to use it for bringing new and valuable things into existence.

1.3 Creative confidence

The greatest inspiration for my thesis has come through Kelley and Kelley’s (2013) book Creative Confidence which is a practical guide for enhancing the use of creativity. Kelley and Kelley have a long experience about innovation and design thinking in an innovation firm IDEO. Based on their experiences they state that individuals tend to underestimate their creative potential. In the book Kelleys strive to unleash the creativity which they intensely value.

Kelley and Kelley (2013: 1–5) claim that people tend to connect creativity strictly to arts like painting, music and theater and this narrows down people’s ability to use their creative talents. Kelley and Kelley state that everyone has a creative potential and the thing people are lacking is actually this trust into their own creativity and possibility to create a change in the world by using it. To overcome the obstacles in the path of creativity they launched a term creative confidence. With it they refer to a trust into one’s own abilities to be creative and to implement the created ideas. Thus creative confidence has two-sized structure (see Figure 1).

![Figure 1. Structure of creative confidence](image)

The call for creative confidence reminded me about my personal experience of participating a Demola project and I got motivated to research whether Demola helps students to gain more creative confidence. My study constitutes a scientific extension for Kelley and Kelley’s (2013: 9–10) book where the important issue of creative confidence is raised up but not scientifically engaged. In this master thesis I define creative confidence through the concept of creative self-efficacy (Bandura 1997) and
self-efficacy concerning implementation of one’s own ideas in order to approach the topic with scientific literature. This connection into self-efficacy is well justified as Kelley and Kelley themselves refer to the father of the concept, Albert Bandura, when explaining the meaning of the creative confidence.

1.4 Research gap

Open innovation as a scientific concept was introduced by Chesbrough (2003) in a book *Open innovation The New Imperative for Creating and Profiting from Technology*. In the book open innovation refers to situation where innovation practises of a company are carried out in co-operation with other actors. The early research about the topic was gathered to the book Open Innovation Researching a New Paradigm (Chesbrough, Vanhaverbeke & West 2006). In the book activities and phenomena of open innovation are explored in different industries verifying and extending open innovation as a new paradigm of innovation. Key features of open innovation such as networks and intellectual property rights are addressed. The perspective in the book early is company centered; case examples address open innovation between businesses. Universities are addressed in the article of Fabrizio (2006) where they are examined as a source of knowledge. Fabrizio argues that a trend of increasing patenting of universities’ research results in the United States complicates open innovation activities of firms and sees patenting as an unsatisfactory method for universities to benefit from open innovation.

Afterwards the research has continued with the emphasis towards businesses. It is noted that the existing research emphasizes the effects that university-industry collaboration brings on the private sector in terms of innovative activity (Perkmann & Walsh 2007). The impact that universities’ co-operation with the private sector has to educational acts of universities is recognized as a subject that should be studied more (Perkmann & al. 2013). More widely the whole field of open innovation activities between the private sector and public sector actors, particularly universities have been recognized as a research gap (Kutvonen & al. 2013). In this master thesis I address this research gap by examining open innovation activities between universities and the private sector from the university perspective.
If the public sector’s participation in innovation represents a research gap in the field of open innovation research, Demola as an open innovation platform has not been studied much either although there has been an international interest towards the concept. More research about Demola would be needed in order to investigate the advantages of the concept. As far the most important study concerning Demola is Kutvonen’s (Kutvonen 2012) dissertation concerning open innovation.

Kutvonen (2012: 22–23, 58–59, 68) addresses Demola as an open innovation platform. His study focuses on outbound open innovation activities that enable companies to benefit from inventions which are not going to be commercialized by the company itself. Kutvonen examines how to connect those into the entire innovation process and firm’s strategy. He investigates Demola’s possibilities to function as an open innovation platform in the fuzzy front end of innovation. By fuzzy front end Kutvonen refers to the ideation and opportunity identification before the structured stages of company’s product development process. Kutvonen and Havukainen (2011) argue that Demola can act as a valuable method for identifying false negatives i.e. profitable ideas that are for some reason evaluated to be unworthy. In addition they highlight Demola’s value for employment creation as students are able to be employed by the partnering firm or establish a startup which utilizes the outcome of the project.

Along with business studies Demola has been addressed also as a subject of educational studies. Wessman (2015) has examined Demola as a learning environment in a master thesis and investigates its effects to students’ expertise. Results indicate that Demola project improves students’ expertise as well as skills of argumentation, problem solving and critical thinking.

Besides of the research field of open innovation my master thesis also contributes to the field of psychology as I use a concept of self-efficacy to define creative confidence more closely. Self-efficacy is a concept created by Bandura (Bandura 1997) and it refers to person’s view about his own capabilities to complete a certain task. Numerous psychological studies have been made about self-efficacy and its influences on different fields of action such as athletics (Barkhoff & Heiby 2010) studying (Wilhite 1990), leadership (Ng, Ang & Chan 2008) as well as connections between self-efficacy and mental disorder (Bandura & al. 1999).
Self-efficacy concerning creative tasks is referred as creative self-efficacy and it has likewise been studied before by many researchers. One popular subject on the field has been a connection between creative self-efficacy and creative performance. For example Karwowski (2011) studied student’s creative self-efficacy and found that creative abilities and originality predicted only 12% of the variances in creative self-efficacy meaning that many students were misjudging their capabilities. He found that men were more likely to overestimate their creative abilities whereas women more likely underestimated theirs. Abbott (2010) has investigated the latent structure of self-efficacy and developed a tool for measuring it.

Altogether all elements of this research have been studied before separately but this is the first time they are combined. In this master thesis I build a connection between self-efficacy and open innovation. In a larger scale the master thesis contributes to the scarcely addressed field of the benefits which universities gain through open innovation activities. Traditionally universities have been seen as dispensers of open innovation. However seeing raise in students’ creative confidence as an income of open innovation activities enables a wider perspective where universities are also receivers of end results. Thus my master thesis will be valuable addition to the scientific discussion concerning the field of open innovation and creative confidence in it.

In addition the knowledge achieved in this master thesis may have practical benefits for companies and organizations where creative confidence is wished to flourish. Actions that have raise in creative confidence in Demola may be possible to copy in order to achieve parallel change in other communities. Results may also be useful for people who want to increase creative confidence of their own.

Finally results of this master thesis are also valuable for Demola organization. List of the benefits that Demola projects bring for students contains contacts to business partners, rehearsal of presentation skills, team work skills and study grades (Ruf & al. 2012, Demola network 2013) but effects to students’ mental abilities are not mentioned. This master thesis helps to solve whether increased creative confidence could also be mentioned as one benefit of participating into Demola project.
1.5 The research questions

Depending on a field of study Demola experience may differ a lot from the way of studying students are used to. In the beginning of a Demola project students receive an assignment from their partnering company. During the three and half months lasting project their aim is to further develop and test a nascent idea of the partner company. Students aim towards a result that is able to bring financial value. They work in multidisciplinary teams, practice brainstorming and learn how to validate their ideas. The project includes also pitching events where students are able to get feedback about their ideas. In the end students introduce their idea to the company partner in a form of a demo. If the company decides to licence it, students will get financial income from the project.

All this means that students get to work hands-on and they have a chance to apply the knowledge they have gained through theoretical studies. Students from different fields of study will be addressed with challenges of business. In a diverse team they are also able to learn from students that represent other fields of study. The aim of this thesis is to explore how these experiences in Demola affect students’ creative confidence.

Thus the main research question is

**How does the participation into Demola project affect student’s creative confidence?**

I will address the main research question through two sub questions:

**Does the participation into Demola project rice student’s creative confidence?**

**What causes the change in students’ creative confidence?**

My interest is to investigate if the Demola project changes students view about their own abilities. Does the project help them to see the full potential of their creativity? Does it give them trust that by working hard they can bring something new to the existence; that they are in fact able to change the world around them? My hypothesis
is that a positive change occurs in students’ creative confidence during a participation into Demola project. In order to test my hypothesis I complete two surveys to measure the creative self-efficacy of students in the beginning of and after the Demola project. The change in the results of the surveys will either justify or refute the proposed hypothesis.

The second sub question focuses on the causes of the change. According to Bandura self-efficacy is increased through mastery experiences, verbal encouragement, by observing success of others and benefitting rather than becoming distributed by emotional and physiological states. I examine whether these change factors stand out in Demola project. In addition I consider role of Demola stuff, business partners and other participating students in the change of creative self-efficacy. In order to scrutinize the role of these change factors I use data of semi-structured interviews as well as free-form answers given in the surveys. This qualitative data is analyzed with thematic content analysis meaning that particular themes are selected from the data and examined. Part of the rised themes come straight from the research data through recurrence and another part is brought in by combining and analyzing the qualitative data in light of existing research from the fields of open innovation and self-efficacy. The answer for the second subquestion is formed based on the themes of the content analysis.

The structure of this master thesis includes six main chapters. This introduction is followed by a theoretical part which is divided into two main chapters. Chapter two addresses open innovation and chapter three familiarizes the reader with the psychological concepts of self-efficacy and creative self-efficacy. In the main chapter four I am going to introduce the used research methods more closely. In the fifth main chapter I will present and analyze the results and final chapter is dedicated for the conclusions of the study.
2 OPEN INNOVATION

2.1 Principles of closed and open innovation

Traditionally companies have produced innovations through their own research and development processes and taken them to market through own distribution channels. This way to understand and organize innovation is referred as closed innovation model, because the innovation process is completed inside the company borders, closed from external actors. (Chesbrough 2003: xxi, 2).

Principles of the traditional closed innovation are often illustrated with a picture of a funnel (see Figure 2). The funnel represents the product development process of a company and research investigations of the company are described as small objects going through the funnel. Research investigations raise from the science and technology base of a company and enter to the funnel from the side of the wide mouth. After entering to the funnel of closed innovation research investigations have only two choices: they can either founder and be stored in a company shelf for possible later utilization or exit from the narrow stem of the funnel as products that are suitable to company's current market. The walls of the funnel cause that nothing can enter to or exit from the funnel during the product development process. Thus research, development and distribution are all handled inside the company walls – represented by the funnel – without external actors. (Chesbrough & al. 2006: 2).

Figure 2. Funnel of closed innovation (Chesbrough, 2003: xxii)
Open innovation in turn refers to a situation where a process of developing new products and bringing them to market does not happen inside the borders of a single company. In a funnel metaphor switch from closed innovation model to an open one would mean that the funnel is poked full of holes (see Figure 3). Holes enable external actors to participate the development process on every stage of it. In the beginning of the process research investigations may raise either from the internal or external technology base. They may enter to the funnel through the holes during the product development process in form of a venture, external research process, licenced technology or technology equisition. The funnel of open innovation also has multiple exits. Consequently research projects do not end up waiting in a selb if they can not be utilized in the company’s own market. Another company may be able to take the product to the market or the inventing company can enter a new market with a new business model. (Chesbrough 2003: xxiv–xxv, 182–183,189).

Chesbrough (2003: xx) has argued that open innovation forms a new scientific paradigm in commercializing industrial knowledge. Being a new paradigm in a Kuhnian sense means that the paradigm represents a new revolutionary way to understand reality (Kuhn 1970: 10–11). Thus open innovation redresses an old paradigm of closed innovation by offering a better way to describe the product development process. On the other hand open and closed innovation can also be seen as models of action. This makes it possible to say that a company is acting based on...
closed innovation model or based on open innovation model or as the trend is: the company is taking steps towards open innovation.

In the following sub chapters I will first describe the principles of closed innovation model more closely and then introduce the circumstances that caused a shift from those into open innovation. I will explore the features and challenges of open innovation model and lastly describe how open innovation is executed in Demola.

2.2 The virtuous circle of closed innovation

Closed innovation model was largely utilized during the 20th century because it fitted well to the surrounding business environment. It created a virtuous circle of research, innovation and profitability (see Figure 4). On the first state of the profitable circle was R&D with new promising research findings. On the second state these findings were successfully developed into products and launched into markets. Through sales the company got revenue which was invested back into the company by establishing new R&D projects. Thus the last state of the virtuous circle led back to the first one and enables the company to achieve new breakthroughs and even more revenue. (Chesbrough 2003: xx-xxi).

![Figure 4. Virtuous circle of closed innovation (Chesbrough 2003: xxi)](image-url)
Maintaining virtuous circle of closed innovation required trust into company’s inner abilities in generating new innovations. By controlling all stages of the product development from the innovation to the distribution a company ensured control over the quality of the products and directed the revenue streams to its own R&D practices. (Chesbrough 2003: xx–xxi).

Competitors’ access to the valuable research findings was carefully denied because it would have enabled others to benefit from the results and threatened the company’s income. The model of closed innovation was profitable for big corporations because only they were able to finance long-term research processes needed for successful product development. When information produced in this processes was unreachable for small companies, those were unable to compete with the big ones. (Chesbrough 2003: xx).

2.3 Need to open up innovation

Changes during the end of the twentieth century broke the virtuous circle and led companies to foster open innovation. Several overlapping changes can be identified as drivers of open innovation (Chesbrough 2003: xxii–xxv).

First the mobility of educated people increased during the last years of the twentieth century. When people moved from workplace to another they brought their knowledge from the previous company with them. In order to have access to the unleashed information companies were ready to pay high salaries for talented workers. Thus the mobility of workforce and knowledge was increased even more. (Chesbrough 2003: xxii, 34–35).

Another change factor was the expansion of venture capital from 1980 onwards. This investment boom that made start-up firms attractive in the eyes of talented staff of large corporations. Educated workforce saw start-ups as an opportunities to utilize ideas that were born in R&D processes of big corporations but were not commercialized by the companies. (Chesbrough 2003: xxiv, 37–39).
In the closed innovation model un-utilized ideas were used to store in secrecy inside the company borders. However investment into start-ups enabled employees to establish new companies around these ideas. Thus the profits of the R&D breakthroughs did not end up financing the new research round of the company where the innovation originated and the traditional cycle of closed innovation was broken. (Chesbrough 2003: xxiv, 38–39).

At the same time open innovation was fostered through increasing complexity of products. During the last decades of 20th century computers, microelectronics, and telecommunications began to drive techno-economic growth in the world. Collaboration of companies and also interaction between companies and universities was an enabler of the entrance into a new era of technical history. (Freeman & Louçâ 2001: 314, 318). The need for co-operation was identified for example by Victor and Boynton (1998: 198–199, 204) before the concept of open innovation was even formulated. Authors used a term of co-configuration to gasp the idea of developing products in co-operation with customers and distributors. Co-configuration was valued because it helped to develop products that answered to customers needs. However the co-operation did not end to a launch of a new product but continued as a relationship between the actors.

In the world of 2010’s the needed knowledge is spread so widely that companies cannot own all knowledge needed in their production process (Christensen 2006: 58). Software and information technology have raised the complexity of products resulting that an individual firm cannot own all knowledge that is needed in the R&D and production process. Consequently companies need to co-operate in order to bring new products to the market. (Hagedoorn 1995, Hobday, Rush & Tidd 2000). For example in international software industry the number of connection between firms increased strongly during the late 1980s and 1990’s. Netwroks enlarged concurrently with the development where the knowledge needed in the production transferred from a single company to different actors of the competitive market. (Cloodt, Hagedoorn & Roijakkers 2010).

In addition the life cycle of technologies has shortened. Thus companies are pushed towards open innovation practices. Because lot of it happens around the company
investing only in internal R&D would leave the company aside of some critical innovations and hinder its possibilities to success. (Chesbrough 2003: xix, xxiii, 6).

Need for a larger know-how actualizes also in demand for services. Products are not necessarily sold alone but packed together with services that increase the brought to the user. Owners and users may need help in planning and designing and they may be willing to buy training and technical support, financial assistance and consultancy services. Offering these can be a competitive advantage for the producing company. (Gann & Salter 2000).

Concurrently the growth of internet has revolutionized communication. Easy access to Internet enables people to build large networks. All people with internet access are now also able to produce information, instead of being only receivers of it like in a mass-media model. (Benkler 2006: 34, 91, 461–462, 468). Computers have challenged old hierarchical organization structures of firms and increased the importance of networks. Digitalization enabled rapid access to information for all actors in a network fostering collaborative research, joint ventures, consultancy and tacit informal collaboration which are crucial to open innovation. (Freeman & Louçã 2001: 324–327).

All these factors have acted as fosters of open innovation. The need for openness of innovation varies between firms and industries. In some industries the virtuous circle still exists (Chesbrough 2003: 34). Some industries such as food and drink industry are still holding on traditional closed innovation based model although there is increasing pressure to open up innovation activities (Pellegrini, Lazzarotti & Manzini 2014).

2.4 Inbound and outbound open innovation

Open innovation can be divided into two processes: inbound and outbound open innovation. Inbound innovation refers to channels and methods which are used along with company’s own R&D in order to generate new products and bring them to market. (Chesbrough 2003: 183–189). In a funnel metaphor (see figure 3) this refers to the
holes from which the new ideas flow in. Thus inbound open innovation is substitutive for the internal R&D activities.

Methods of inbound open innovation are multiple. A company may for example develop an external research organization by investing in start-ups or partnering with them (Chesbrough 2003: xxiv–xviii). New ideas may be brought in through licensing, spin-offs, spin-ins, corporate venture investments, joined ventures and alliances (Vanhaverbeke 2006: 205-206, 208). Also customers can form a channel of innovation when they are involved into production process through activities which are referred as democratization of innovation (von Hippel 2005: 1). Customer’s point of view is valuable as companies’ success is based on ability to fulfill customers’ needs. (Victor & Boynton 1998: 183, 184, 191)

Universities act as a channel for inbound open innovation through research partnerships, scientific publications, informal interaction through networks and social relationships, research services like consulting, human resource transfer such as training and commercialization of property rights. (Perkmann & Walsh 2007). Demola for its own part acts as channel of inbound open innovation by offering university students’ knowledge and ideas to be utilized by companies.

Outbound open innovation in turn refers to actions that help innovation to flow outside of the company boarders. In the funnel metaphor these activities are described by the holes that offer possibility to exit from the funnel before the narrow stem. (Chesbrough et al. 2006: 2–4). Outbound open innovation acts as an option for internal development. Through these activities the ideas developed in the company or adopted into it can be developed further outside the company. (Michelino & al. 2014).

Outbound innovation is helpful because all technologies and ideas generated by company’s R&D do not end up to final products of the company itself. Majority of the invented technologies are patented but never utilized by the company itself. Some may be seen too expensive to develop or by other means unsuitable for the company’s use. Outbound open innovation provides a strategy to actualize the value of these unutilized inventions. (Chesbrough 2003: xxii–xxvii).
Engagement into open innovation practices depends on the strategy, industry and the internal activities of a firm. External sources are used to complement internal practices in order that firms with lacking for instance production and marketing activities stand out as aggressive licensors of these functions. (Fosfuri 2006). As an example biotech companies typically benefit from outbound open innovation because they hold high focus on internal R&D activities but little interest in commercializing products. Thus outbound open innovation constitutes an important revenue steam for them as it enables them to license and sell findings of their internal R&D. (Michelino & al. Lamberti 2014).

2.5 Challenges of open innovation

Opening innovation practices helps companies to cope with challenges such as complexity of products and short product life-cycles but it may also bring new challenges in exchange. Three most relevant challenges in the field of open innovation are challenges of not invented here (NIH) and not sold here (NSH) syndromes, appropriability and trust.

Not invented here (NIH) syndrome refers to an irrational rejection of valuable knowledge because of its origins outside of the contextual, spatial or organizational boundary. NIH is caused by individual attitude-based bias towards external knowledge. When management is affected by NIH syndrome, company suffers losses because beneficial knowledge and technologies are abandoned only because they are not invented inside the company borders. Thus NIH syndrome constitutes a barrier for inbound open innovation activities. (Antons & Piller 2015).

The biased attitudes may be unconscious and can occur also in companies that have decided to engage in open innovation activities. Thus companies with inbound open innovation activities should recognize the challenge NIH syndrome. It has been suggested that NIH could be tackled by increasing decision makers’ interaction with external actors for example in conferences and cross industry work groups. NIH syndrome can also be tackles by using de-biasing approaches, where the attitudes are analyzed in order to prevent them to affect behavior. (Antons & Piller 2015)
Not sold here (NSH) syndrome is analogous to NIH syndrome with the difference that in NSH syndrome the biased attitudes are directed to outbound open innovation activities. In NSH syndrome activities where knowledge is spread outside of the company borders are irrationally rejected. Thus NSH syndrome complicates externalizing the firm’s knowledge and cause difficulties in fulfilling managerial goals in this area. Reason for objecting knowledge transfer to external actors may be for example a fear that by doing so the inventing company hinders its own capabilities to compete in the market. (Lichtenthaler, Ernst & Hoegl 2010). Thus the problem is connected to appropriability challenge which is a third and very essential challenge of open innovation.

The core of the appropriability challenge is the difficult task of ensuring that the original innovator gets gains from her innovation when the innovation is shared to the use of other parties. Appropriability can be ensured for example through intellectual property laws, patents and licensing contracts which allow innovator to capture profit from her innovation. These means are traditionally seen to foster open innovation because they enable firms to gain profit by sharing their knowledge through open innovation activities. (West 2006: 109, 129). Evidence for this has been found from software industry where growth of patenting has increased together with the movement towards open innovation. (Mowery et al. 2001: 188). On the other hand open innovation can also exist without strong appropriability. An example of this is open source software movement where technologies developed in collaboration are available for buyers at little or no cost. (West & Gallagher 2006: 82–83).

Appropriability strategies and policies are industry specific, for example patents ability to ensure gains for the patent-owner is weaker in computer and electronics industry than in chemical industry (Anand & Khanna 2000). In a medical industry patents have the strongest ability to ensure appropriability and they are widely used when knowledge is transferred from public research to companies R&D. (Cohen, Nelson & Walsh 2002). Coping with appropriability challenge means continuous balancing between collaboration and competition, value creation and value capturing, openness and control. (Simcoe 2006: 162). In addition strong intellectual property rights may raise ethical questions. Is it for example right to deny access to innovation tools and information when they would help low and middle income countries to foster
innovation and education? (Benkler 2006: 468). In a smaller scale companies have to ensure their own income without losing trust of their partners. Maintaining this trust constitutes the forth challenge of open innovation.

As open innovation happens in co-operation with other actors, it holds essential connection to the growth of networks (Freeman & Louçã 2001: 327). Networks have been viewed through various perspectives each of which offers different view about the force that holds the network together. The element of trust is incremental for networks. (Miettinen & al. 2005: 346–347). Thus it here seen as a forth challenge of open innovation.

In a social network view social relationships are understood to create the trust that binds the network actors together. (Miettinen & al. 2006: 8). Another view is to see the links of the network as actors who work under shared rules, roles and institutions. In this case the actors of the network are bind together by a confidence when they rely on that all actors of the network obey the shared rules. Within the rules the actors are able to pursue their own interests and aim towards profit maximizing. (Miettinen & al. 2006: 17–18).

As innovation refers to building new entities actors in an innovation network cannot place their trust in existing institutions and structures to maintain the trust (Miettinen, Toikka & Tuunainen 2005: 352). Some innovation networks such as Silicon Valley are very open for new participants and do not hold close social relations among the actors. This means that existing social relationships cannot be the origin of the trust. Instead trust is performance-based. (Cohen & Fields 1999). Trust in innovation networks is developed and maintained through a co-operation where actors aim towards a shared goal. In order to maintain the network actors must have trust into their co-operation and the entity they are building together. (Miettinen & al. 2005: 350–352). This concept of trust resembles Sabel’s (1993) theory about studied trust. According to Sabel a trust in economic relations can be achieved when partners adopt open-minded view and dare to expect the others are trustworthy.

In the absense of trust building structures the trust in innovation networks is fragile. Vulnerability is caused by the possibility that co-operation can quickly turn into
competition and change the logic of the trust based networking to rationally calculated income maximizing. (Miettinen & al. 2006: 9, 58). Trust is tested particularly at the point where a together innovated product is launched to markets. The situation actualizes questions concerning property rights and sharing the revenues and changes the logic from trust based co-operation into profit maximizing. (Miettinen & al. 2005: 352–353).

Tuunainen (2011) and Tuunainen and Miettinen (2012) have investigated emergence of trust in negotiations between firms that aim towards international co-operation. Findings of Tuunainen’s research showed that in the earliest stage of co-operation trust emergences for example through a strong interest that partner shows towards the project, consistent and transparent behavior and acknowledged technical competence of the partner. Distrust in turn emerged when a partner for instance did not follow the assumed negotiation timetable or behaved in a way that was not expected or could be interpreted as non-transparent. According to Tuunainen and Miettinen maintaining and building the trust continues through obedience to the jointly agreed rules and contracts as well as collaboration opportunities that enable partners to learn about each other’s expertise.

Building trust is incremental for network co-operation and learning. (Miettinen & al. 2005: 346–347). Thus it forms a crucial element also for Demola where innovations are built in co-operation with students, companies and Demola staff.

2.6 Open innovation through Demola

Demola is an open innovation environment for university students and companies. The first Demola was launched in Tampere in the year 2008 and since then the concept has been copied into eleven locations worldwide for example to Canary Islands, Mexico and Namibia. In Oulu Demola started in 2012 (Demola Oulu; Demola webpage).

Demolas have been funded by local universities and some of them have been co-founded by European Regional Development Fund as well as regional actors (Vesikukka, M. 2012, Euroopan sosiaalirahasto 2015). Staff of Demola Oulu is hired
through University of Oulu and Oulu University of Applied Sciences and during the studied project it included the head of Demola and two facilitators.

Demola staff finds companies with business challenges to partner with student teams. Challenges that form the base of the Demola project may be ideas that need to be tested and developed further or open questions that need to be validated such as “Should the company expand to a certain new location?” or “How could a company market its products to students?” These business challenges define the basis of Demola projects. Students apply to the projects based on short description about the business challenges and partnering company. Alternatively they can let Demola staff choose a project for them. Demola staff organizes diverse teams to work with the assignments.

The structure of a Demola process (illustrated in Figure 5) follows an established format with slight modifications. In the project where the data of this research was collected kick-off meeting started the Demola season. In the first meeting students got to know each other and the basics of Demola process. After the start students had the first meeting with their business partner. Meetings with the partner continued during the process frequency of them depending on the partner. Each student team also organized team meetings for example once a week during the whole project. After the start the projects continued with an ideation workshop where student teams were guided to brainstorm in order to produce numerous solutions to the given business challenge. In value creation meeting they were encouraged to approach the challenge from different angles in order to come up with new viewpoints. In addition they gained an experience of prototyping their ideas in creative ways for example by using Lego Duplo blocks and plasticine. For the feedback fair students chose one idea to be introduced with a rapid prototype. In the event they got feedback which enabled them to develop the idea further. The development, validation and sometimes also creating new ideas continues in team meetings. In pitching events student teams pitched their ideas for audience and get feedback. The final pitch event is also graduation event for the Demola students and best teams are awarded.
In the end of the project the partnering company decides whether it wants to license the end product of the project. Students own the intellectual property rights of their demo. (Ruf & al. 2012). If the company is not willing to buy the demo, students may continue developing the idea by themselves (Kutvonen & Havukainen 2011). Running a Demola process from the beginning to the end lasts approximately three and half months. One process cycle of the process is organized on autumn and another one on spring period. Demola Tampere organizes projects also during the summer (Demola website).

By these activities Demola constitutes a link between companies and universities. From the company point of view Demola projects is an inbound open innovation channel when participating students ideate a new concept or innovation based on the business partner’s needs. In this development process students use their learning income gained through university studies. Thus Demola helps information to flow from universities to the private sector.

However it is also possible to perceive Demola projects as an outbound open innovation activities of the partnering companies. Companies can use Demola project in order to validate usefulness of a nascent idea that is in danger to be abandoned by the company. If the project endcome validates the abandonment and partnering company does not want to license the end result of the Demola project students are

![Figure 5. Structure of the Demola process](image-url)
able to develop their idea further for example by establishing a start-up. (Kutvonen & Havukainen 2011). In this case the original idea was made by the company but transmitted to a group of students. Information flew from companies to a potential start-up company by using Demola project as a channel of outbound open innovation.

The benefits from Demola projects are divided between students, university and partnering companies. Students learn agile product development and presentation skills with the help of Demola facilitators. They earn credit points to their studies and form valuable contacts to the partnering company. (Ruf & al. 2012). In 2011 15% of the students attending to Demola projects were recruited by the companies after the projects (Kutvonen & Havukainen 2011). In addition students gain experience and learning income, and – as this master thesis indicates – more confidence to their creative abilities.

In the next main chapter I will take a closer look to the concept of creative confidence. First I will introduce few different explanations through which creativity has been defined. Then I will connect creative confidence into larger context of scientific studies by using psychological concept of self-efficacy. Through this connection it is possible to utilize the existing self-efficacy research in order to determine how creative confidence can be improved.
3 CREATIVE CONFIDENCE

3.1 Defining creativity

The aim of my master thesis is to address creative confidence in the context of open innovation. The connection between innovation and creativity is obvious as innovation requires creation of new solutions. These in turn cannot be reached without the gift of creativity. However the essence of creativity itself is anything but apparent. Thus it is important to explore how creativity has been defined in a scientific context.

In the field of psychology creativity has been given various definitions. Traditional psychology approached it as a gift or property of an individual. (Miettinen 2006). More recent approach has been to understand creativity as a socially constructed concept (Csikszentmihalyi & Wolfe 2014). In this subchapter I will first introduce Guilford’s (1950) individualistic view of creativity as a personal trait. Secondly I will explain another more practically view of creativity which is also based in individualistic view. Thirdly I will introduce the systems view of creativity as an example of a view where creativity is seen as a construction of a social process. I will also discuss how the definition of creativity affects the way people think about their own possibilities to be creative. In the end of this chapter I will justify the definition that is preferred in this paper.

Guilford (1950: 444) represents traditional way to understand creativity. He defined creativity as a set of personal traits. In his view each person is born with some amount of creativity and changes over time do not exist. This creativity is expressed through certain kind of behavior such as inventing, designing, contriving, composing, and planning. Thus Gilford sees creativity as a set of individual abilities. However this definition does not allow possibilities to improve as a creative actor. Thus it motivates to look for geniuses who are born with unusually high creativity but for people who do not consider themselves as creative persons this theory does not provide any motivation to improve creativity.

Afterwards Guilford’s (1950) view about creativity has been used as a base for research to build a more definite picture about creativity. Many researches have been
made in order to find a single factor that would predict high performance on creative tasks. However nothing that kind of has been found. Accordingly creativity has been argued to consist of many domains which together constitute the high level of creativity. (Brown 1989).

Second way to define creativity is to see it through the outcome of an individual’s mental actions. When understood in this manner creativity “refers to the production of something original, novel, innovative, and meaningful.” (Teo 2014: 325). This definition drives attention to the outcome of the creative process. This shift away from inner abilities is helpful particularly when creativity is measured. Evaluating the originality, novelty, innovativeness and meaningfulness of a created product may appear easier than evaluating inner personal traits. Some evaluations even require that the created idea is actually put to use resulting that others can easily see if it works (Martindale 1989: 211).

However in essence defining creativity through results does no differ much from Guilford’s (1950) view because people use their personal abilities to create the valuable idea. As such the spring of creativity still lies inside a person who has completed the act of creation yet attention is not driven to inner abilities but to the value of the idea. The shift may still have major consequences to person’s understanding about his creativity. When ideas and their valuation are in center, people are motivated to produce those by using their creative talents – whether they are geniuses or not. This view of creativity fits well to business where ideas can be valuated based on their profitability and other qualities such as environmental and social value they produce.

Third way of seeing creativity differs fundamentally from the previous ones. It is called systems view of creativity because creativity is seen to be constituted in a tripartite system: field, domain and individual. Field refers to the set of social institutions which define which solutions are creative and which are not. Domain in turn refers to areas where creativity can be practiced. Music, mathematics, philosophy and visual arts are examples of domains. When an individual creates something in a certain domain, he or she causes a change in it and field decides whether the change is to be considered as a creative one. (Csikszentmihalyi 2014: 47, 51).
Because creativity estimated by other individuals on the field, social and cultural aspects affect creative performance more than personality traits. From this point of view being creative requires that a person has had an opportunity and willingness to learn how to perform according to the rules of the domain, for example learns how to play the piano. Only then will she be able to change something. If the change is seen as a valuable one by others the person has done something creative. However also in system model personality traits such as courage to challenge existing rules, divergent thinking and tendency to find problems are important. They increase the likelihood that a person’s idea is recognized to be creative. (Csikszentmihalyi & Wolfe 2014).

This view sets creativity tests into new light because no objective standard for creativity exists. Evaluation relies on changing cultural aspects such as trends and training. (Csikszentmihalyi 2014). From systems perspective everyone with access to a certain domain has potential to be recognized as a creative person. However it is possible that the value of a person’s work is not recognized by other people or that it is recognized only after a long time period has passed and the social system on the field has changed. The view points out that in order to be recognized as a creative person, one usually has to be very active. First one has to take over a domain of activity which may require great effort. One has to understand the rules of the domain so well that he or she is able to create something new for them. And after this one all the more must make others to believe that the change was valuable.

These three views on creativity: individualistic, practical and systems view have one thing in common: They all connect creativity with novelty. Thus I define creativity here as an ability to generate novel ideas. This definition is also inspired by Kelley’s who object the view where creativity is understood to belong into arts alone. When creativity is understood as an ability to generate ideas, its importance in every field of action is understood better. For instance in business new ideas are needed when new products are generated. They are needed when a company seeks for a useful strategy to tackle challenges or survive from a crisis. Creative ideators work in attempt to create a marketing campaign that brings the best result. Ideas are also needed in production where efficiency of the process can be improved through innovative solutions.
The ability to be creative is highly valuable for all but the value is not actualized unless people use their talent. As seen above all theories of creativity do not encourage in improving personal creative abilities. This may hinder the willingness to act creatively particularly if one’s capabilities are underestimated. Therefore the trust that one is able to be creative is needed in order to utilize the full potential of a person’s creativity. From the point of view of this study it does not matter whether one is able to improve his creative potential or not. My starting point here is that rising a person’s trust into his or her creativity enables one to benefit more from the existing creative talents. Thus the focus lies in the confidence which is needed in order to benefit from the available potential. Next I will examine this confidence more closely through the theory of self-efficacy.

3.2 Concept of self-efficacy

The developer of the self-efficacy concept, psychologist Albert Bandura (1997: 21) defines self-efficacy as

"a judgement of one’s ability to organize and execute given types of performances – “.

In other words a person with high self-efficacy believes that he or she has what it takes to succeed. In contrast a person with low self-efficacy doubts her chances to perform what is needed. (Bandura 1997: 21).

Strong self-efficacy is connected to self-confidence in front of challenges, strong commitment into adopted tasks and quick mental recovery after failures. Low self-efficacy in contrast may lead a person to avoid challenging tasks. It lowers the tendency to give up. People with low self-efficacy visualize themselves failing whereas people who believe they can make it visualize success scenarios. In addition people with low self-efficacy tend to explain failure with their poor aptitude whereas people with strong self-efficacy believe that failures were caused by insufficient preparation or deficient knowledge. (Bandura cop. 1997: 21, 73–75).

A person has distinct self-efficacy beliefs about different realms of function such as entrepreneuring, parenting or creativity. Inside these realms self-efficacy beliefs can
be divided to beliefs concerning various domains of activity (Bandura 1997: 36). For example creative self-efficacy can be split into self-efficacy beliefs concerning more specified activity domains inside the field such as brainstorming, associating or further developing ideas of others.

Self-efficacy impacts on how people succeed. Personal skills form a basis for the successful performance but end-result is bended by self-efficacy beliefs. Thus people with high self-efficacy tend to perform better than people with similar skills but lower self-efficacy. (Bandura 1997: 39, 73–75). As such activities that raise self-efficacy can release unused potential within people.

Innovators and other people who pursue high goals with unconventional thinking must be well-equipped to endure hardships. As drivers of certain kind of reformation they are likely to face social rejection from the part of people who favor conventional way of doing things. Optimistic self-efficacy beliefs are thus important for innovation. Strong, even unrealistic trust into one’s abilities to control the situation and to success helps innovators to overcome the faced setbacks. (Bandura 1997: 72, 75).

On the other hand strong trust into own ideas raises the risk of dismissing well-grounded social skepticism towards the feasibleness of the idea. As a result fruitless ideas may be driven forward with great effort. This leads to misdirected ventures and waste of resources. However also low self-efficacy can be seen to cause waste of resources. It is possible that two people with same level of skills differ in their performance because another has strong self-efficacy and is thus able to perform better. Thus low self-efficacy prevents a person from using his or her full existing potential. Conversely self-doubts are beneficial when they are linked to infirm skills when they drive a person to acquire higher level of know-how. (Bandura 1997: 72, 76).

Overall it can be said that a reasonable level of self-efficacy is important from the point of view of innovation. For example during the Demola project self-efficacy is needed in order to keep working despite difficulties and rejections and to fully benefit from the capabilities that one has. Without self-efficacy high skills and knowledge are left underutilized which is costly in individual, organizational and societal level.
Correspondingly the subject of next chapter – improving self-efficacy – is important for everyone willing to drive innovation whether independently or organizationally.

3.3 Improving and managing self-efficacy

Bandura lists mastery experience, vicarious experiences, verbal persuasion as well as physiological and affective states as four sources of self-efficacy (Bandura 1997: 78). In this chapter I shall examine each of these change factors in turn.

*Mastery experiences* are the most important sources of self-efficacy. Generally speaking success raises self-efficacy and failures lowers it. When people act in order to achieve goals, they adjust their self-efficacy believes based on the results they achieve. If the result is valuable trust into one’s abilities raises and if not a person tends to doubt his abilities in future. However this kind of division is heavily simplified and does not capture nuances of the reality. When people alter their efficacy beliefs based on performance they consider the perceived difficulty of the task, the amount of effort they put into it, the amount of help they received, existing circumstances and other factors beside the success or failure division. Also pre-existing understanding about oneself affects the interpretation of faced success and failures. If perceived results are not in line with person’s self-efficacy they are more likely to be discounted or explained by external factors rather than by inner abilities. (Alden 1987, Bandura 1997: 80–82).

*Vicarious experiences* as the second source of self-efficacy, refer to act of observing the success of social models. It may cause an increasing effect to the observer’s self-efficacy. An inverse effect is caused when seeing others failing despite high effort. Assumed similarity to the social model determines the power of the effect: the greater the similarity the greater the effect into self-efficacy. Through observation of social models people can also learn better skills and strategies for managing environmental demands which leads to better self-efficacy. (Bandura 1997: 87–88, 93–94).

People value their own performances by comparing their results to the others. By observing others performing people learn skills and knowledge, get motivated to self-development and receive information about the demands of tasks. When a person
observes people with similar capabilities to success it increases person’s self-efficacy. Models may be found from everyday life, from classmates, project partners but also from media. However it also self-modeling can used to increase self-efficacy; for example seeing own successful performance in video strengthens trust into own capability. (Bandura cop. 1997: 87–88, 93–94).

*Verbal persuasion* is the third way to improve self-efficacy. Telling people that they are able to achieve what they pursue has a positive effect on the self-efficacy. It makes people try harder and thus use their full potential. On the other hand telling people that they can achieve more than they believe does not necessarily make it so. In the worst case the effect of the feedback can be contrary to the desired one. Certain qualities are typical to feedback that raises self-efficacy. First encouragement must be in line with receiver’s real capabilities. Overoptimistic appraisal of the performance may be denied as implausible or considered to be believable only for distant future. From self-efficacy point of view the encouragement is most effective when the stated level is only moderately beyond person’s own view about his talents. Secondly feedback should highlights achieved goals instead of focusing on tasks that have not yet been done. Thirdly the effect of verbal persuasion is connected to the status of the person who gives the feedback. A feedback by a trust worthy and proficient person most likely strengthens self-efficacy. (Bandura 1997: 101–106).

Lastly *physiological and affective states* affect self-efficacy. The effect caused by them is mediated by cognitive process and environmental actors. Thus perceived physical reactions such as aches, fatigue, sweating, trembling as well as mood states can have either positive or negative effect to self-efficacy depending on how they are interpreted. For example sweating during a presentation can be interpreted as a natural cause of existing physical conditions or as a personal failure. Also the level of arousals affects the interpretation Generally high arousals heighten the level of performance while moderate level of activation raises attentiveness and facilitates deployment of skills. (Bandura 1997: 106–109).

People with low self-efficacy are more likely to give negative interpretations to their feelings and physiological reactions whereas people with stronger self-efficacy tend to see them as facilitators of the performance (Hollandsworth Jr, Glazeski, Kirkland,
Accordingly negative moods activate memories of past failings and leads lowers trust into own efficacy (Bower, Sahgal & Routh 1983). Thus physical reactions and moods and self-efficacy recursive circle where positive self-efficacy fosters interpretations that strengthen the self-efficacy even more and low self-efficacy leads to decreasing interpretations. This circle can, to some extent, be influenced by the person itself for example by enhancing positive mood and interpretations made from physical reactions. (Bandura 1997: 106–113).

3.4 Defining creative confidence through self-efficacy

The concept of creative confidence includes both trust into one’s own abilities to be creative and to implement the created ideas (Kelley & Kelley 2013: xv). Bandura in turn defines self-efficacy as one’s trust into his or her capabilities. He also argues that people have separate self-efficacy beliefs concerning different fields of action. (Bandura 1997: 21, 36). Based on the similarity of concepts I will now define creative confidence as a specific field of self-efficacy, more closely as a combination of two distinct fields of self-efficacy.

In the first, introducing chapter I demonstrated the structure of creative confidence with a picture of two halves, one holding persons trust into his or her creativity and another holding trust to the ability to implement the created ideas. Together these believes constitute creative confidence. Similarly I now define creative confidence through the concepts of creative self-efficacy and self-efficacy in implementing ideas (See figure 6).
Thus creative confidence can be defined as a combination of two kinds of self-efficacy: creative self-efficacy and self-efficacy that a person has towards his or her own abilities to implement ideas. The latter half of the definition is strongly linked to world view because it indicates whether a person believes he or she is able to actively generate changes to the world around or not.

Creative self-efficacy as a scientific concept has been researched from two different angles: as a creative thinking self-efficacy and creative performance self-efficacy. The former refers to self-efficacy concerning idea creation and latter to self-efficacy concerning creative acting in a workplace, classroom or other authentic environment. (Abbott 2010: 2). Creative thinking can be further divided into four latent factors: elaboration, flexibility, fluency, and originality. Elaboration creativity in richness of details. Flexibility becomes apparent in ability to come up with plenty of ideas for example by looking the issue from different perspectives. Fluency refers to ability to come up with great number of ideas that do not have to be radically different from each other. Lastly originality refers to an ability to come up with unique ideas that have not been found by many others. (Torrance 1979: 36, 43–48, 66–72, Abbott 2010: 179).
Creative performance self-efficacy in turn refers to self-efficacy concerning idea creation and latter to self-efficacy concerning creative acting in a workplace, classroom or other authentic environment. (Abbott 2010: 12). The theory of creative performance is tied to systems view of creativity presented by Csikszentmihalyi and Wolfe (2014). Creativity is here divided into three latent factors: domain, field and personality. Creative performance is seen through mastery of a domain like music or poetry, field which validates the creativity of a person and creative personality. (Abbott 2010: 21, 18).

In this master thesis I will not dig deeper to this division because of the limited length of the thesis. Nevertheless all seven mentioned creativity factors were present in the data collection because I utilized Abbott’s research tool for creative confidence when constructing the surveys. By doing so I aimed at exploring creative efficacy from many different perspectives. Following chapter holds more detailed information about the used research methods.
4 RESEARCH METHODS

4.1 Research method

The data collection for this research was three-part.

1. First part included two surveys first of which measured the starting level of creative confidence and later the level of creative confidence after the end of the Demola project. All students participating in Demola projects in autumn 2015 were invited to answer to the surveys by an e-mail invitation which contained a link to the survey. In addition students who did not answer to the survey were sent another invitation to remind them.

2. In the second part of the data collection I held an interview with three students after they had finished Demola project. Two of the interviews were held in Business Kitchen and one in the Oulu University campus.

3. Thirdly I collected ethnographical field research data by attending events and workshops arranged for Demola students. During the events I made notes and took photographs. The collected data is not visible in this thesis in form of pictures or citations but it enabled better understanding and analyzing of the data collected by the surveys and interviews as well as deeper understanding of the Demola process.

Surveys and interviews constitute the primary data of this research. I used them as the basis of the analysis. Ethnographical field research data was utilized as a secondary data: observations in project meetings provided deeper and more concrete understanding about the examined phenomenon. Thus they were helpful while interpreting and analyzing the primary data.

4.2 Surveys

Quantitative part of the research data was collected with two surveys. First of the surveys was conducted at the beginning of the projects and the second at the end of them. The aim of the surveys was to collect data about the level of student’s creative
confidence. The change in Demola participants’ creative confidence was investigated by comparing answers given to these two surveys.

The constitution of the survey questions began with ideation of possible questions based on Kelleys’ (2013) view of creative confidence. Bandura’s (1970: 43) recommendations for measuring self-efficacy guided the survey formation. Bandura suggests that self-efficacy should be measured by claims that begin “I can do” rather than “I will do”. Answerers of the survey are asked to estimate the validity of these statements. Thus self-efficacy is measured as a perceived capability, a person’s view about his or her abilities. The first version of the survey was built applying these guidelines into context of creative confidence as Kelleys’ define it.

This first version of the survey questions was printed and tested by asking approximately 50 students of Oulu Business School to fulfill it and give feedback about it. After the test round the survey was modified by replacing part of the questions with the questions inspired by Abbott’s (2010: 156) thesis where the author constituted a tool for measuring creative self-efficacy. Similar to Abbott’s instrument the implemented surveys contain questions from different areas of creativity: fluency, flexibility, elaboration, originality, domain, field and personality. Abbott’s instrument offers an investigated and tested method for measuring creative self-efficacy and thus increases the credibility of the results. In difference to Abbott’s instrument the number of questions concerning each area of creativity was reduced from three into one in order minimize the risk of answerers intermitting the survey because of the length of it.

However the Abbott’s tool covered only the first half of the creative confidence concept, the creative self-efficacy. It did not measure the implementative side of creative confidence. Thus I decided to complete the survey by adding questions that measure how much confidence students have to their ability to fulfill their creative ideas and drive change in the world by using their creativity. Few of these questions hold entrepreneuring as a concrete example of creating something concrete based on one’s creative ideas.
In the end of the surveys the students were asked whether their experiences in Demola had affected their answers. Answerers were also asked to describe the possible change and cause of it by free words.

Thus the survey ended up to include three kinds of questions:

- questions that measure person’s trust into his or her creativity in overall (ideated from the base of Kelleys’ (2013) book)
- questions concerning creative self-efficacy (Abbott’s tool for measuring creative confidence)
- questions concerning self-efficacy in implementing the creates ideas (eg. in entrepreneurial context)
- questions about the effect that Demola has had to the answers

The final survey included 18 questions (see Appendix 1). Surveys were implemented through ZEF editor tool provided by Oulu originated company ZEF. In ZEF editor answerers use free scale between statements “I agree” and “I disagree” for answers. ZEF provides also tools for analyzing the results. The link into the survey was sent to all students who were attending Demola project at the moment by the head of Demola Oulu, Pekka Silven.

4.3 Timing of the surveys

Before the implementation of the first survey students had already taken part into two Demola meetings, Kick off –meeting and ideation workshop (See figure 7). This means that experiences in Demola may already have caused changes in their creative confidence.
In order to take this into account a question: "Do you feel that your experiences in Demola so far have influenced on how you answered to the previous questions?" was added to the survey. In addition students were asked to describe the occurred changes and causes of them by free words. Slightly over half of the answerers estimated that their experiences in Demola had already influenced on how they answered to the questions. This may mean that the actual starting level of creative confidence may have been even lower than the results of the first survey point out.

However the position of the first survey after the start of the Demola projects is justifiable as the measured efficacy beliefs were connected to actions which were more or less unfamiliar to the students. According to Bandura a person who knows what the performance of the task demands has better abilities to esteem his abilities to perform the task. If a person has to esteem his efficacy in a task he has not experience about he can use efficacy beliefs concerning subskills that are needed in a new task. It has also been suggested that when self-efficacy is measured with a test, answerers should not make judgements about their capability without a clear activity or task in mind. Otherwise there is a danger that answerers do not actually know what is meant by the question. (Bandura 1997: 51, 64). Thus the placing of the survey just before the start of Demola project increases value of the results.

4.4 Interviews

Qualitative part of the research is completed through three semi-structured interviews. Interviews deepened the knowledge gained through surveys and help to understand why a certain kind of change occurred in creative confidence and what were the main reasons for the change. The interviews were designed to capture interviewees thoughts about the changes in creative confidence. Thus they were loosely structured by a set of questions concerning increase of creative confidence during the Demola project (see Appendix 2). Interviewees were encouraged to tell concrete examples for example about moments which they experienced to be encouraging from a creativity point of view. In the end of the interview they were asked to evaluate the effect that Demola’s physical and social environment, the partner company’s representatives and other participating students had to their creative confidence during the project.
Interviewees were first sought by an e-mail message but as the responses were very few I requested two more students in the Demola graduation event to take part into this second part of the research. The sampling size of the interviews was kept in three in order to enable the analysis of the data in the limits of one master thesis. Because of the small sampling size I followed a sampling strategy which aimed towards heterogeneity of interviewees in gender, nationality, university they study in, study program and teams they belonged in Demola. The heterogeneous sampling strategy ensures that the findings of the interview do not represent only some particular group inside the sample but are widely shared (Robinson 2014: 27–28). Interviewees 1 and 2 were male and interviewee 2 was a female. More detailed information about the interviewees can not be given in order to protect their anonymity.

Duration of each interview was approximately 15 minutes. Interviews were transcribed and two of them were translated from Finnish in English.

4.5 Analysis methods

The survey results were used to study the hypothesis whether or not the participation into Demola project increases student’s creative confidence in other words self-efficacy concerning creativity and ability to implement person’s own ideas. Arithmetic mean and median of the survey answers were used to clarify whether the results rose or degreased between the first and the second survey. I also examined answers to the survey the two sides of creative confidence concept separately in order to validate that the change occurred in both creative self-efficacy and efficacy towards implementative side.

Interviews were transcribed and analyzed together with free-form answers of the surveys. I used thematic content analysis aiming to solve what explains the change that occurred in the quantitative data. Practically this means that the interview answers and free-form answers of the surveys were analyzed in order to find which themes recur and what kind of aspects interviewees express about them.

The most important theme in the qualitative data described the increment in creative confidence. I used data concerning this theme was used to deepen the understanding
about survey results and to validate interpretation of them. Other themes that were identified from the qualitative research data with the help of former research were mastery experience, hands on work and social interaction. I used these themes in order to answer to the research second research question: “What caused the change in students’ creative confidence?” In the following chapter I will introduce results of this research.
5 INCREMENT IN CREATIVE CONFIDENCE DURING A DEMOLA PROJECT

5.1 General look at the research results

Answer to the first research question “Does the participation into Demola project rice student’s creative confidence?” was investigated through two surveys. Surveys were designed to measure students’ trust into their creative abilities in overall as well as two halves of the creative confidence concept (illustrated in figure 6 on page 34). The first half of creative confidence refers to trust that they can manage in tasks that require creativity as a mental ability. It was operationalized with the help of Abbott’s (2010) tool for measuring creative self-efficacy. The latter half refers to turst in ability to implement one’s creative ideas. In the surveys this latter half was measured by questions concerning ability to make changes in the world and also by asking respondents’ trust into their abilities to successfully start an own enterprice. The full list of survey questions can be found from the Appendix 1.

Response rate of the first survey was 49,1 (26/53) of which three respondents interrupted the survey before its end. From the part of the second survey response rate was 28,0 % (14/50) and all answeres finished the survey. The analysis below is done based on all given answers.

In order to find how the level of creative confidence changed during the Demola project students were asked to answer to the same questions in the beginning (survey 1) and at the end (survey 2) of the Demola project. When analyzing the survey results I found that the arithmetic mean of the answers rose between the surveys. The arithmetic mean of all answers given in the first survey was 70,2 and in the second survey 78,0. When measured by the median the rise was from 75,4 to 85,8. Thus the survey answers indicated systematic growth in creative confidence during the Demola project.
Figure 8 illustrated the change in the arithmentic mean between the surveys. The ball with “1” on the upper line points the arithmentic mean of the first survey and the ball with “2” on the lower describes results of the second survey.

![Arithmetic mean of the survey answers](image)

**Figure 8 Arithmetic means of the surveys.**

Raise of confidence level in general was endorsed by many of the free-form answers of the surveys and by the interviews. In this qualitative data respondents did not mention the concept of creative confidence. Instead they widely described the fields where their confidence had raised. For example respondents specified that they had gained more confidence in their leadership skills, teamwork skills and expertise during the Demola project.

“"I am more confident that I can be professional and taken seriously, that my ideas and skills are valuable and that I have skills that a lot of people don't -- I can provide things for the team that otherwise wouldn't be done. Demola has helped me see how I can use my skills in working life. (Free survey answers)"

“"[I had] More confidence for everything." (Free survey answers)

“I would say that the [Demola] project had me confident and had me rely I have lot of potential too” (Interview 1)

“I have also learned from this project that I'm able to be project manager and people can count on my word and orders.” (Free survey answers)

“"[Demola project] showed me how my field of studies actually pays off” (Free survey answers)

“"[Demola project] made me realize the thing that my expertise was really high.” (Interview 1)
“Working with people from other fields made me feel professionalist in my own field.” (Free survey answers)

This qualitative research data indicates that students had more confidence in their abilities through participation into Demola project. Same kinds of results have been found also in earlier research where students’ expertise as well as skills of argumentation, problem solving and critical thinking have been found to increase during a Demola project (Wessman 2015).

Interestingly only few respondents of the surveys mentioned directly creativity in their free-form answers. Other fields of improved self-efficacy gained more attention. This is particularly increased creative confidence was distinct in only two of the free-form answers.

”The effect [of the Demola project] was that I could start thinking out of the box. Even though my ideas are not that crazy, but i can provide many ideas instead of which the most are actually makeable. I guess Demola had a really good effect on think over problems in different ways.” (Free-form answer in a survey)

”––after few weeks I started thinking about what I am able to do in this project and how can I use my thoughts in real life” (Free-form answer in a survey)

Affirmative answers to the last question of the survey “Do you feel that your experiences in Demola so far have influenced on how you answered the previous questions?” increased from the first to second survey (Figures 9 and 10). These results indicate that students felt that Demola process had influenced to their answers. Some influence was identified already in the first survey, after the two first Demola meetings.

Figure 9 Arithmetic means of the 20th survey question in the 1st survey.
Thus it seems obvious that participating Demola project influences how students evaluate and understand their creativity and efficacy concerning creativity and implementing the created ideas. Interestingly students did not emphasise this in the free-form answers of the survey. One possible explanation for this may be that students are not used to think creativity as a skill that could or should be trained. Mentioned skills of leadership, teamwork and expertise in own field are perhaps considered more important and therefore mentioned. These skills may be more highlighted for example in job advertisements and students learn to drive attention to them.

Accordingly the general results of the surveys seem to indicate that students’ creative confidence increased during the Demola process. However the change was not very apparent in the free-form answers which may indicate that the change was not very well recognized by the students themselves. Although majority of the answerers felt that they got more courage they did not specify it into creative abilities.

An interview answer describes well how a student still has difficulties to consider themselves as creative person although she experienced the project to increase her trust into her creative abilities.

“I don’t consider myself as a very creative person. I’ve always seen myself as a kind of very logical person. I like use more a kind of rational thinking and that kind. So I don’t feel I am, I would say that I felt when I was around twenty years old I was then more creative than I am now. So I don’t know where it has dropped off during the years but erm maybe I… I would somehow connect creativity with spontaneity… so maybe that is why I don’t connect creativity with myself because I don’t really see myself as a spontaneous person.”
Thus the Demola project did not actualize Kelleys (2013) vision about all people recognizing themselves as creative ones. However the rise in the arithmetic mean of the surveys indicate that the Demola project had positive effect to students’ creative confidence. In the next two subchapters I will scrutinize the research data from a point of view of two halves of creative confidence. Subchapter 5.2. will consider creative self-efficacy, which means one’s trust to his or her abilities to be creative and subchapter 5.3. will consider changes in self-efficacy considering implementation of one’s ideas. My aim to find answer for the first research question and explain what kind of change has happened in the creative confidence of students during the Demola project. The focus will lie on the data collected by the surveys but I will fulfill the picture with qualitative research data that was collected by ethnographic field research and by the interviews.

5.2 Changes in the creative self-efficacy

Part of the survey was designed to measure student’s creative self-efficacy. This section was inspired by Abbott’s (2010: 156) tool for measuring creative self-efficacy through seven dimensions: fluency, flexibility, elaboration, originality, domain, field and personality.

**Fluency** means that the ideas created by a person are very different from each other. **Flexibility** refers to ability to create plenty of ideas concerning to a single problem and **elaboration** becomes apparent in richness of details. **Originality** means that a person is able to create unique ideas that are not likely to be invented by others. **Domain** refers to ability to success in a certain field of action. **Field** represents people who should be convinced in order to be evaluated as a creative person. Therefore good scores in a dimension of field refer to skills of convincing others about the value of one’s ideas. Finally the field of **personality** refers to personality traits that are typical for creative people. (Torrance 1979: 36, 43–48, 66–72, Abbott 2010: 21, 18, 179)

The survey covered one question about each dimension. Survey results show that the arithmentic mean of scores in self-efficacy concerning fluency, flexibility, elaboration, domain and field raise from the first survey to the second one. In turn scores in originality and personality were a bit lower in the second survey. However the
decreasement is not significant. Figures 11–17 show the changes in these seven fields of creativity. Blue ball with the number “1” describes the arithmetic mean of the answers given in the first survey and red ball with the number “2” arithmetic mean of the answers given in the second survey. Darkened area around the balls represents interquartile range.

5. I am good at finding a great number of solutions to a problem. (Fluency)

Figure 11 Arithmetic means of the 5th survey question.

6. I see myself as a person who can find many different types of ideas while considering a problem. (Flexibility)

Figure 12 Arithmetic means of the 6th survey question.

7. I am good at further developing ideas of others, even the crazy or wild ones. (Elaboration)

Figure 13 Arithmetic means of the 7th survey question.
8. I think that my ideas are unique, others won’t come up with the same ideas that I do. (Originality)

Figure 14 Arithmetic means of the 8th survey question.

9. I feel that I could well start developing myself in a field that is totally new for me. (Domain)

Figure 15 Arithmetic means of the 9th survey question.

10. I trust that I am capable at convincing others that my idea is valuable. (Field)

Figure 16 Arithmetic means of the 10th survey question.

11. I can well keep wondering about something, even after working with it for years or decades. (Personality)

Figure 17 Arithmetic means of the 11th survey question.
Increase in means of fluency, flexibility, elaboration, domain and field show that students’ trust into their abilities in these fields rised during the Demola project. Ethnographic field research data sheds light on the cause of this improvement.

When collecting ethnographic field research data I observed how students got to practise these fields of creativity in Demola meetings. In ideation workshop student teams were encouraged to brainstorm in order to come up with as many ideas as possible. Demola facilitators circulated the room. Whenever they saw a student team where the creation of new ideas seemed to decelerate they helped students to find a new perspective to the subject. Students were guided to write down their ideas so that they were visible for later speculation. As the brainstorming went on, teams had their papers full of ideas and students were able to see how their creativity had worked. The event created a concrete experience of using creativity in a business context. Students got to use their creativity for creating plenty of ideas. These kinds of experiences during the Demola project offered students to experiment their skills in dimensions of creative self-efficacy: brainstorming session offered an ability to practice how to create plenty of ideas, answering to the needs of the company partner within an diverse team allowed ability to learn from professionals of other fields and experience how well they can adopt new knowledge, in pitching events students were to preset their ideas so that others would be convinced. It is likely that this ability to practise creativity and get guidance from Demola facilitators has raised students’ creative self-efficacy.

Interestingly also decrease of creative self-efficacy occurred in two of the measured dimensions: originality and personality. Ethnographic field research data can be used to explain changes in originality. In a Demola project students work within teams. When students ideate together, they get a change to compare their skills in creativity to those of other teammates. In Demola meetings students were also able to observe results of other teams’ ideation processes. In the meetings students were several times encouraged to introduce their ideas aloud to all present teams. Learning and ideation methods that were used in the meetings favored physical results in form of prototypes, drawings and mindmaps (see example of a mindmap created in an ideation meeting in Figure 18).
Making ideas concretely visible gave students opportunity to compare outcomes of their creativity to those of others. Decrease in the mean of originality may result from this chance to compare the originality between own and other students’ ideas during the Demola process.

Also answers to the question referring to personality decreased slightly. Surveys, Interviews or ethnographic research data that was collected to this research do not reveal clearly justifiable reason for this change.

In this chapter I have examined the survey data concerning creative self-efficacy that forms the first half of the creative confidence concept and focuses on mental abilities. In the next chapter I will move on the latter half of creative confidence by examining that the qualitative survey data reveals about Demola project’s ability to foster trust in one’s skills of implementing creative ideas and driving world by using creativity.
5.3 More confidence in implementing ideas

Beside creative self-efficacy the surveys were to measure self-efficacy concerning the implementation of own ideas. Ability to implement ideas was asked straight in one question. Two other questions measured the executive side of creative confidence by asking about students trust into their abilities of establishing an own business. Establishing a company was here seen as an act of building something concrete based on own ideas. Thus it concretized the thought of using creativity for changing the world.

Already the act of applying into Demola project shows certain interest towards business and possibly entrepreneuring. Likewise the answers to a question concerning ability to implement own ideas (question 12) indicated self-efficacy already in the first survey. Change between the arithmetic means of the answers given in the first and second survey indicate that Demola process increased students’ self-efficacy concerning idea implementation. (Figures 12–14).

Figure 19 Arithmetic means of the 15th survey question.

Figure 20 Arithmetic means of the 16th survey question.
From the part of questions where entrepreneuring was used to concretize the implementation of one’s ideas (questions 13 and 14) the arithmetic means of the first survey were lower but the change during the Demola project was bigger. This may indicate that participating in Demola project helps students to trust that they are capable of establishing an enterprise. In the question concerning ability to make changes in the world remarkable change did not occur during the project.

The implementative side of creative self-efficacy was visible also in one of the interviews.

“I got -- a kind of self-confidence in own know-how that really I got those good ideas and I am able to implement those in this way that I have something to offer for that field also.” (interview 3)

“-- I would like to do things that really benefit people and am not staying at the academic world, so that strengthened that in a way that those things that I do, those can really be useful for people, that brings a good feeling to myself that one can by that way save the world... That it doesn’t stay in an academic bookself collecting dust, it can really -- some way have an influence to lives of people.” (interview 3)
The citations show how raise of creative confidence during the Demola project has inspired the interviewee to use her creativity. Expertise and creative confidence are here bound together. Demola project has brough trust that by combining creativity and academic knowledge one can create innovations that bring practical benefits for people. The same interviewee experienced that Demola project encouraged her to consider entrepreneurship as an option for the future.

“[During the project I began to think that] – – maybe at an idea level – – I could someday become even an entrepreneur, so like I have had that I have pretty good ideas and I am also capable to implement those so it’s like maybe some day if it feels like that I could start entrepreneuring. Before this project it was like “Nope! Not in any case!”” (Interview 3)

The citation describes well the change that has occurred in the self-efficacy during the Demola project: before the project the interviewee did not consider entrepreneurship as an option in any case but after the project she has started to gingerly consider the option to be an entrepreneur. Trust to the value of own ideas in mentioned as a reason that fostered the change.

In this subchapter I have pointed out how the increment in self-efficacy concerning the implementative side of creative confidence became apparent both in the survey and the interview data. It is clear that students experienced a change towards stronger creative confidence during the Demola project. In the following subchapters I will take a closer look to hands-on work, mastery experience and social interaction as reasons that explain why the recognized change occurred. The aim to find answer to the second research question “What causes the change in students’ creative confidence?” The examination is done mainly by means of qualitative data that was collected through the interviews and the free-form answers of the surveys.

5.4 Rising creative confidence through hands-on work

Based on ethnographic research data I have proposed that this ability to do things hands-on partly explains why students gained more trust to their creative abilities. Now I will justify my conclusion by using interview data and free-form answers of the questionaires.
In the qualitative research data that was collected through free-form answers in the surveys as well as through interviews students mentioned hands-on creative work as a thing that fostered their creative confidence. The citations below bring evidence to the conclusion that opportunity to experiment one’s creative skills during a Demola project allows students to strengthen their trust in their creative abilities.

“Demola has given me to experience the real world work building up my confidence to work in real life.” (Free-form answer in a survey)

“[My confidence rised] when I ----- create[d] whole webpage myself in the autumn break” (interview 1)

“Just the thing that I get to do the thing hands on [changed my understanding about my creativity] -- -- In the beginning I had a feeling that I like don’t have any kind of creative bone in my body but then after that [I felt] that well actually I have decent ideas that those are there... especially when I get to try things like brainstorming which I had never done before I noticed that those ideas are there…” (interview 3)

The last citation gives ground for presumption that all students have not come across with similar kinds of creative assignments previously. Answers reveal that for some of the students Demola project was the first chance to test their skills in for example brainstorming. In this sense their creative creative confidence was established based on this Demola project.

This means that when students estimated their ability to perform these tasks before the project they could not use their memories from the previous experiences as a basis for the estimation. In this kind of a situation people form their self-efficacy beliefs based on the subskills which they assume to be beneficial in the new task. (Bandura 1997: 51). During the Demola project these preassumptions of own abilities got tested and students established a new set of self-efficacy beliefs. With the help of these new beliefs they are able to trust that they can handle also future challenges where these skills are needed.

Another evidence for the finding that Demola project acted as an establisher of new self-efficacy can be found through analysis of the answers that did not indicate raise of creative confidence. When asked about the effect that Demola has had to the answes
that students gave in the surveys few students reported of a zero effect. In their free-form answers to the surveys they explained the absence of influence by high starting level of confidence and large number of previous equivalent experiences.

“[This Demola project] didn’t affect me at all because I have always been an innovative person” (free-form answer in a survey)

“I have seen many serious - sometimes successful - starts of real new business around new innovations and I have lived longer than many in the course. Thus, a short-term course like Demola doesn't bring much new to how I feel myself, estimate my strengths and weaknesses or develop as a person” (free-form answer in a survey)

These experienced people did not gain new information about their capabilities through Demola project. They had already established their self-efficacy beliefs based on previous experiences and the project offered only redundant information for them. This redundant information does not affect self-efficacy because it does not reveal anything new about person’s capabilities (Bandura 1997: 81–82). Respondents who commented about the zero effect were all men. Previous research has found that women are more likely to underestimate their creative capabilities. (Karwowski 2011). In my study notable gender differences were not identified.

The above introduced qualitative data confirms that the ability to experiment creative skills in a concrete way during a Demola project fosters the rise of students’ creative confidence. In case where a student has gained similar kinds of experiences before the Demola project the effect is nullified.

5.5 Mastery experience as an improver of creative confidence

According to Bandura (1997: 80) mastery experience is the most powerful fosterer of self-efficacy; when people experience success in pursuing their aims, their self-efficacy is likely to raise. Accordingly success in the Demola project stood out as a reason for the increased self-efficacy in the interviews and in the free-form answers of the surveys. When asked to describe reasons for increase creative confidence students recalled moments where the value of their work was acknowledged.
“Some way the thing that the firm were we visited liked our idea and wanted to further develop it [changed my understanding about what is possible for me]. That is something… like that left a positive insight about this whole Demola project at least.” (Interview 2)

“I would say that especially when in the beginning we were to develop as many ideas as possible and then we had to — choose the best ones of these and we gave them to our customer that ‘hey we have here forty ideas that could you choose something around ten of them, your top ten which you consider the best ones?’ and when I noticed that okay my ideas were standing out as the best ones then I had a good feeling that okay the customer likes also our ideas that it is a good thing.” (Interview 3)

“Mostly the risk of drawbacks is something that made me even more aware of what you can encounter when doing business. All of our first ideas were pretty much ‘denied’ by some important contacts of us, and only three weeks before graduation we got a new idea, which won in the graduation event! So as a group and individual, I learned pretty well to stand strong when you encounter such a fallback when you have to start over basically.” (Free-form answer in a survey)

In the last citation a survey respondent described that success in the project was achieved after drawbacks. According to Bandura (1997) resilient trust into own capabilities is born especially through such experience of overcoming difficulties through perseverant effort. In Demola projects all students are allowed and encouraged to finish the project even if they face difficulties and cannot come up with a sufficient solution before the very end. Thus the duration and structure of a Demola project act as enablers of these self-efficacy fostering experiences.

One way to foster mastery experiences is to teach what kind of strategies are likely to lead to success and to persuade that a person is able to achieve high goals by following those strategies. (Bandura 1997: 80). These kinds of activities were present in workshops that were organized as parts of the Demola project.

The research data shows that company’s interest towards student team’s idea and the team being rewarded in a graduation event were interpreted as signs of mastery experience. Success in the project was identified with the help of these. Thus rewarding and feedback are beneficial from the point of view of creative confidence. Fostering those enables students to benefit more from the in terms of increased creative self-efficacy. Social connections to partnering companies and Demola facilitators have
an important role mediating this increment of creative confidence. In the next subchapter I will introduce the effect of social interaction as a third theme that explains the growth of creative confidence during the Demola project.

5.6 Diverse effect of social interaction

According to Bandura (1997: 87–88, 93–94, 101–106) social interaction may have manifold effect to self-efficacy through received feedback, teaching and observing how others success. The research data of this study indicates that social interaction during the Demola project was experienced to have both increasing and decreasing effects to creative confidence.

First the trust from the side of Demola facilitators was experienced as a motivator that encouraged students to do their best.

“They [Demola staff and facilitators] --had a lot of trust on our project and they show a lot of support on our team and --- me too — The feeling that they [Demola staff and facilitators] trust you… they trust you a lot -- that make you want to… not betraying their belief. And improve yourself and make something better for them… not for them but for the sake of their believing.” (Interview 1)

This is a good example of effects that a well formed feedback can bring. Facilitators had successfully convinced a student about his abilities and thus encouraged him to aim high and use his full potential. The interviewee points out that that he had to improve himself in order to fulfill the expectations of the facilitators. This indicates that facilitators’ expectations were in line with the real capabilities of the student. If expectations had been overoptimistic the encouraging effect would not have occurred (Bandura 1997: 101–106).

However another interviewee would have wished facilitators to be more easily available and more active in looking after the teams. Experienced disappointments were recognized to have a negative impact to creative efficacy.

“’It felt like -- are they [facilitators] even interested. It was a bit difficult.“ (interview 3)
Similarly the cooperation with the business partners were experienced to have both increasing and decreasing effects to creative confidence. Problems in the co-operation were caused by language barriers and difficulties in meeting and contacting the partner. These were experienced to influence negatively on the creative confidence.

“The first thing I don’t like about him [a business partner is that] he talk in Finnish… very rude. Because – – I had to skip the half of my exam – – to have a meeting but he talked in Finnish and I waited an hour to hear that and I don’t quite understand Finnish a lot.” (Interview 1)

“– – we should have met him [the business partner] more -- and he didn’t show up.” (Interview 1)

“And I assume that the communication ended [because the business partners representatives] were satisfied with the project but it would have been very nice if they had said that ‘Hey, everything is ok’ because I clearly asked that ‘hey we have tested our thing, could you please all the more give feedback that we have one week to do this’ but nothing.” (interview 3)

These citations imply that difficulties in communicating with the business partner made students feel less confident about their creativity. Students wished that they could have met with the business partner more. When desired meetings could not be arranged students experienced dissatisfaction and confusion.

Tuunainen (2011) identified communicating strong interest towards the co-operation as a trust creating feature. Qualitative data of my research indicates that students who experienced difficulties in communication with the business partner were ashtonished by the difficulty to contact the business partner. The situation resambles Tuunainen’s view about unexpected behavior as a source of mistrust. Thus it seems that mistrust on a company partner hindered the students’ ability to establish and grow their creative confidence during the Demola project.

On the other hand the qualitative research data includes also an example of strong trust between a business partner and a student team. One of the interviewees described how the company partner communicated trust to the student team’s ideas and encouraged students to use their creativity.
our contact person said that in the beginning he/she tried to be like… doesn’t want to lead us towards any direction but to let us ourselves find the thing from there. In a way they tried to push innovativeness and creativeness from that side also… to us. They didn’t try to influence on us for what to think. Then it was a bit difficult to think that what we should do but afterwards thinking it was good that they didn’t tell us that “do this!” In fact they didn’t do anything like that.” (Interview 3)

This indicates that when the company parter had strong trust into the student team, it fostered students’ view about their ability to generate good ideas and implement those. Thus the effect of trust in creative confidence was twofold: trust caused a positive effect to creative confidence whereas mistrust was seen to hinder it.

The citation above implicates also business partner’s openness for new ideas. The business partner is seen to avoid transferring his or her own ideas to the student team. This exemplifies that the company is not highly affected by Not invented here (NIH) syndrome which is one of the challenges experienced in open innovation activities. Companies with low NIH attitudes are open for external knowledge whereas companies with high NIH attitudes imply irrational rejection of external knowledge. (Antons & Piller 2015). Business partners with low NIH attitudes seem to be beneficial for Demola students’ creative confidence as they are likely to approve student’s ideas and thus encourage students to believe in their abilities. The encouragement given by one delegate does not necessarily indicate the amount of NIH attitudes in the company and students’ idea may be neglected later on. However for students the attitudes of the contact person are probably the most important ones because they represent the approval or rejection of the whole company.

In addition to trust and NIH syndrome appropriability as a third challenge of open innovation appeared in the interviews. Problems in appropriability were seen as a source of disagreement.

“And then he [the business partner] keep consisting that we will make the whole application for him just for three credit. — I don’t think he understand the concept of the Demola yet” (Interview 1)

An interviewee experienced that the demand of the business partner was too high compared to the benefits that students got through the project. The notion shows that
the interviewee is concerned about appropriation which is one of the key challenges of open innovation. The interviewee stated this comment as a part of answer to the question about business partner’s role in the change of creative confidence. Thus it seems that if a student feels that appropriability is not achieved it may hinder his or her ability to benefit from the Demola project in terms of creative confidence. When students feel that their talents are exploited without appropriate compensation, they may draw a conclusion that their own view about their talents is in conflict with the business partner’s view. Consequently they may think that they overestimate the value of their capabilities and are in danger to change their view towards lower valuation. This would mean lower trust into own capabilities, in other words lower self-efficacy.

Finally the interviews endorsed that other students in the Demola project team had a positive effect to creative confidence.

“My team did operate really well -- They were very supportive.” (interview 1)

“We had a very good team. Although it was… occasionally it was frustrating and occasionally very fun.” (interview 3)

“Being part of a team where we all are in the same level has also created an atmosphere where it's easy to tell even the craziest ideas.” (Free-form answer in a survey)

“-- everyone took part to the thing. No-one was like they would not have been interested in it. It like, fostered others. When one throws something, another throws something else to that. It creates a mishmash and everyone gets inspired at some point. It adds more to the creativity.” (interview 2)

These citations indicate that students experienced trust, support and encouragement from their teammates. The last two citations exemplify that students fostered each others creativity when ideating in group. Bandura (1997: 87–88, 93–94) argues that vicarious experiences have particularly strong effect to self-efficacy when the self-efficacy has not been strongly established before and when the objects of observation are similar to the observator. Both of these features actualize in Demola; above it was noted that students’ creative self-efficacy was not established until Demola process. Similarity may be felt because of the unifying factor being that all participants of the projects are students. This explains why modeling other students and seeing them to
use their creativity successfully in for example ideation meetings is described as a fosterer of creative confidence in the situation above.

In this chapter I have analyzed the research data and introduced the findings of the study. Next I will summarize these findings in conclusion.
6 CONCLUSION

In this master thesis I have addressed the effect that Demola open innovation platform causes to students’ creative confidence or more definitely to creative self-efficacy and self-efficacy concerning implementation of a person’s own ideas.

The quantitative research data was collected through two surveys whose results were compared in order to recognize the change that occurred in creative confidence during the Demola project. The qualitative research data was collected by three interviews, by free-form answers of the surveys and by observing meetings in Demola and collecting ethnographic field research data about them.

When analysing the quantitative research data I recognized systematic change towards stronger creative confidence. Arithmetic mean of the survey answers had raised during the Demola project. Thus my hypothesis was endorsed. The increment occurred in both sides of the creative confidence concept; students had more trust into their ability to be creative and to implement their ideas.

On the analysis on qualitative data three elements were identified as causes of strengthened creative confidence:

1. opportunities to experiment creative acts hands-on
2. acknowledged mastery experience
3. trust and encouragement through social interaction.

Demola project’s effect to creative confidence was negated by students who had large prior experience on the field of innovation. Contrary students with little or no prior experience in creative tasks such as brainstorming and further developing ideas acknowledged the change in creative confidence. For them Demola project acted as an establisher of a self-efficacy concerning the field. Accordingly the Demola project forms base for students’ understanding about their creative abilities and affects their future decisions of engaging with creative activities. Achieved creative confidence may help them to perform better in the future as they have more confidence in their
capabilities. After Demola project students may be more active to step into new challenges which they assume to require creativity and ability to implement their ideas.

Company partners, Demola facilitators and participating students constitute a network in which the increment of creative confidence happens. All social actors in the network were recognized to influence into creative confidence. Findings of my master thesis offer help for arranging Demola project so that the positive effect to students’ creative confidence can be optimized.

First company partners can support students’ creative confidence by communicating strong interest towards the project, by being open for students’ ideas and pointing out the value of them. In order to foster students’ creative confidence these things should be taken into account when choosing the company partners. It is important that companies who join the projects are motivated and open for students’ ideas. Demola could encourage company partners to be available for the student team and give feedback to them. Second Demola facilitators can foster students’ creative confidence by convincing students about their abilities with a carefully formed feedback as well as by being available for the students. Students should have clear instructions about how facilitators can be contacted and what kind of help student teams can expect from them. Thirdly other students inside a project team enable growth of self-efficacy through social modeling and reciprocal encouragement. Chances for these are well arranged by offering a space for team meetings and gathering all teams together several times during the Demola process.

Companies’ role in communicating that they were satisfied with the student teams’ ideas is important for the growth of creative confidence. Feedback from the partnering companies as well as from the Demola facilitators appeared to be highly appreciated by the students. The project was seen to success when the partnering company showed interest towards the idea of the student team. This feedback constituted a base for the rise of creative confidence through mastery experience. Thus it is extremely valuable for students.

My study has deepened understanding about the benefits of Demola projects by evidencing that creative confidence can be seen as an important income for university
students from the open innovation project. Demola project offers a good ability for students to explore their creative talents. The structure and content of the Demola process support creative confidence by encouraging to work persistently and including lessons in for example ideation and brainstorming.

Findings of my master thesis are parallel to findings of Wessman’s master thesis (2015). Wessman identified that participating a Demola project improved students’ expertise and fostered skills of argumentation, problem solving and critical thinking. My thesis adds strengthened trust into own creativity to the list of income achieved through a Demola process. In addition my thesis indicate that the previous research findings about trust creation in open innovation (Tuunainen 2011) can be recognized also in Demola projects and they act as fosteres of creative confidence.

More research would be needed in order to generalize the results of this master thesis. The sampling I used covered only one Demola period and qualitative data was limited to three interviews and free-form answers of two questionaires. In the interviews heterogeneous sampling was used in order to increase low generalizability caused by the small sampling size. Still the results cannot be used for generalizations in a large level. Great variation in participating companies and students construe uniqueness of each Demola process. Between different Demola locations the variation becomes even greater because of the cultural differences. These restrictions must be taken into account when the results of my master thesis are utilized.

Reliability of this research is rather good. It was increased by using both quantitaive and qualitative research methods which both indicated the change in creative confidence. Utilization of Abbott’s (2010) tool for measuring creative self-efficacy increased in reliability of the surveys because the tool was well tested. However using the tool per se would have led to even higher reliability. From the part of self-efficacy concerning idea implementaion same kind of tool did not exist. It was difficult to find questions that would catch the idea of implementative side of creative confidence. In the interviews it turned out that students associated question about changing the world with global changes instead of changes in smaller systems and thus answered that Demola did not effect to their trust into themselves to change the world. From this part the formation of the interview questions could have expressed the target concept more
precisely. It is also worth noticing that research data concerning the elements that caused the effect in creative confidence is based on students own understanding about the issue. It is not verified how well they are able to identify the actual effect of each factor.

As an author of the research I do not have occupational connections to Demola. When I participated into Demola events to collect research data I was identified as an external observer, not as part of the Demola staff. Interview data showed that students did not avoid criticizing Demola which could have been the case if I my connection to Demola had been stronger. From this part the reliability of the research was good.

This research does not reveal how long lasting the positive effect to self-efficacy will be. More research would be needed about the long-lasting influences of university-company co-operation through Demola. For instance it would be valuable to know whether Demola as a learning environment raises the amount of university students’ who end up establishing an own enterprise.

Whatever the Demola’s effect to the amount of future entrepreneurs may be in any case Demola helps students to release their unutilized creative capacity. A student’s strengthened creative confidence does not have to be restricted in establishing a company. A student may get inspired to use creative skills in academic world or on some other as well. Creativity is helpful in every field of action but before it can be utilized one must recognize a need of it and trust in his or her ability to use it. My humble wish is that this master thesis would help people to discover the value of creativity and for its own part encourage people to value and use their creative talents.
REFERENCES


Chesbrough, H. (2004). Open Innovation; Renewing Growth from Industrial R&D, 10thAnnual Innovation Convergence, Minneapolis, Sept. 27, 2004


SURVEY QUESTIONS

(Answers in slider scale “I agree” – “I disagree”)

4. I consider myself as a creative person.
5. I have a lot of good ideas.
6. I am good at coming up with new ideas.
7. I have a good imagination.
8. I am good at finding a great number of solutions to a problem. (Fluency)
9. I see myself as a person who can find many different types of ideas while considering a problem. (Flexibility)
10. I am good at further developing ideas of others, even the crazy or wild ones. (Elaboration)
11. I think that my ideas are unique, others won’t come up with the same ideas that I do. (Originality)
12. I feel that I could well start developing myself in a field that is totally new for me. (Domain)
13. I trust that I am capable at convincing others that my idea is valuable. (Field)
14. I can well keep wondering about something, even after working with it for years or decades. (Personality)
15. I believe that if I work hard I can implement my ideas.
16. I believe that I can make changes to the world around me.
17. I believe that my project team benefits from my skills.
18. I feel that I am capable at starting an own business.
19. I am confident that I can put in the effort needed to start a business.
20. Do you feel that your experiences in Demola so far have influenced on how you answered to the previous questions?
21. If you felt that Demola project has affected to your answers please specify what kind the effect is and what has caused it.
INTERVIEW QUESTIONS

How would you describe your creativity? What are you good at?

If you compare your understanding about your creativity before and after the Demola project, what kind of change has there been?

If you think your Demola project, what were the moments and experiences that arose your trust into your creative abilities?

How did the Demola project change your understanding about your possibilities?

Did Demola project encourage you to believe that you are able to create something new to the world by using your creativity?

Is there something that felt impossible for you before the Demola project but now feels possible?

During the Demola project did you come up with new ideas that you are going to implement after the project?

Please describe the effect of the following factors into your beliefs about your creativity and your possibilities of using it:

- Demola physical environment, decoration and architecture
- Demola social environment: facilitators and other Demola staff
- Interaction with the business partner
- Interaction with other students