Aalto University
School of Business

Multidisciplinary Education - Impact on Working Career, Case IDBM

International Design Business Management (IDBM)

Master's thesis

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Abstract

The complex and widely-spread problems that occur in the current business world need multiply skilled employees to solve them. Solving complicated problems also requires scholars and researchers to collaborate with colleagues outside of their own discipline. Hence, educational institutions are constantly striving to develop study programs that aim to combine, integrate, mix or join disciplines in a successful way. These programs are often called interdisciplinary, cross-disciplinary, multidisciplinary or transdisciplinary programs. The case program, International Design Business Management (IDBM) is such a program. In the business world the term cross-functional is often used to describe similar kinds of methods of bringing people from distinct expertise to work together toward a common goal. Such programs, or cross-functional working, are generally considered to be beneficial. However, the empirical evidence of the advantages is somewhat limited. This research provides better understanding of the issue.

After the introduction chapter the case program is introduced, which is followed by a comprehensive literature research. In the literature review it is explored how disciplines have evolved from knowledge, the taxonomy of disciplinarities is introduced, "the best practices" in interdisciplinary education are explored, and the general advantages and challenges of interdisciplinarity are discussed. The chapter suggests that to solve complex problems of the current business world and to succeed in working life, a graduate should acquire a T-shaped competence from his or her studies. This implies deep knowledge and expertise in a single field or discipline (the vertical bar of the T) but also skills to integrate and combine other disciplines, as well as the understanding of how a single field interacts with other disciplines (the horizontal bar of the T). From all the literature findings the theoretical framework is constructed and it is tested in the empirical part of the research.

The empirical part was conducted by using methodology from exploratory research. The research paradigm of the thesis can be positioned between the two extremes; hence the data was analyzed by utilizing mixed (quantitative and qualitative) methods. The target group of the thesis was the IDBM minor business student graduates (n=182) who completed the program between 1995 and 2010. A questionnaire concerning their studies and working lives was conducted for the students. The results were compared quantitatively to the control group (all business student graduates 2000-2010) from two reference studies: SEFE's "Annual Questionnaire for Recent Graduates" and the "Career and Employment Survey" conducted by Finnish Social Science Data Archive (FSD). In addition four in-depth interviews were executed to IDBM graduates to explore more precisely what was behind the questionnaire findings.

The findings of the research show that the T-shaped competence and multidisciplinary skills can be considered beneficial in the business world. The multidisciplinary teams can not only bring significant extra monetary value to the business but the cross-functionality also improves the innovation work. The empirical findings show that at some level the IDBM program provides the needed skills, knowledge and competence to benefit from multidisciplinarity in the business world. An IDBM graduate has been able to apply the skills, learned during the university studies, into practice in working life more often than a regular business student graduate. Cross-functional team work in the business world can generate significant positive synergy, which often creates a better outcome. The IDBM program graduate often has the T-shaped competence to work as a successful project manager in such a cross-functional team. The program is also perceived to be very motivating, and the quality of the education was considered to be particularly high. Despite being a management program, the IDBM minor program does not educate relatively more managers than all the business programs. Even though the thesis indicates some sort of correlation between success and multidisciplinary education, the phenomenon should be further investigated to gain more reliable evidence about the correlation.

Keywords *IDBM, multidisciplinarity, interdisciplinarity, cross-functional team, T-Shaped competence*

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Tiivistelmä

Kompleksiset ja laajalle levinneet liikemaailman nykyhaasteet vaativat monialaisia osaajia ratkaisemaan niitä. Sama koskee myös akaateemista maailmaa: monimutkaiset nykyhaasteet velvoittavat myös tutkijoita monialaisuuteen ja tieteidenväliseen yhteistyöhön. Näistä syistä oppilaitokset pyrkivät jatkuvasti kehittämään koulutusohjelmia, joiden tavoitteina on yhdistää, integroida, sekoittaa tai liittää eri tieteitä menestyksekkäästi yhteen. Ohjelmia kutsutaan usein poikkitieteellisiksi, tieteidenvälisiksi, monitieteellisiksi tai monialaisiksi ohjelmiksi. Eräs tällainen ohjelma on case-ohjelma, International Design Business Management (IDBM). Liikemaailmassa käytetään usein termiä cross-functional kuvaamaan samantyylistä tapaa yhdistää eri alan asiantuntijoita työskentelemään yhteisen tavoitteen eteen. Edellä mainittuja opiskeluohjelmia tai cross-functional-työskentelyä pidetään yleisellä tasolla hyödyllisinä. Empiiriset todisteet eduista ovat kuitenkin vähäiset. Tämän tutkimuksen tavoitteena on tarjota parempi ymmärrys aiheeseen.

Johdantokappaleen jälkeen esitellään case-ohjelma, jota seuraa laaja kirjallisuuskatsaus. Kirjallisuusosiossa selvitetään sitä, kuinka tieteenalat ovat kehittyneet tiedosta, esitellään tieteiden luokittelua, tutustutaan poikkitieteellisen opetuksen ”parhaisiin tapoihin” ja tarkastellaan poikkitieteellisyyden yleisiä etuja ja haasteita. Osiossa ehdotetaan, että ratkaistakseen liikemaailman monimutkaisia nykyongelmia ja menestyäkseen työelämässä, opiskeljian tulisi hankkia T-muotoinen kompetenssi opinnoistaan. Tämä tarkoittaa vahvaa tietoa ja asiantuntemusta yhdeltä tieteenalalta (T-muodon pystypalkki), mutta myös taitoja integroida ja yhdistää muita tieteenaloja sekä ymmärrystä kuinka yksi tieteenala vuorovaikuttaa toisiin aloihin (T-muodon vaakapalkki). Kirjallisuuslöydösten perusteella on rakennettu teoreettinen viitekehys, jota testataan työn empiirisessä osiossa.

Pro-gradun empiirinen osa on toteutettu käyttämällä eksploratiivista tutkimusmetodologiaa. Tutkimuksen paradigma voidaan sijoittaa kahden ääripään välille; tutkimuksen data analysoitiin käyttämällä sekoitettuja (kvantitatiivisia ja kvalitatiivisia) tutkimusmenetelmiä. Tutkimuksen kohderyhmä oli IDBM-sivuaineohjelman käyneet kauppakorkeakoulusta valmistuneet (n=182), jotka suorittivat kyseisen ohjelman välillä 1995 ja 2010. Kohderyhmälle suoritettiin kysely, joka käsitteli opintoja sekä työelämää. Tuloksia verrattiin kvantitatiivisesti vertailuryhmään (kaikki vuosina 2000-2010 kauppakorkeakoulusta valmistuneet), joka saatiin kahdesta referenssitutkimuksesta: SEFEn ”Vuosittainen vastavalmisuneiden kysely” ja Yhteiskuntatieteellisen tietoarkiston ”Viisi vuotta työlämässä” -tutkimus. Lisäksi neljä IDBM-valmistunutta syvähaastateltiin, jotta saataisiin parempi kuva mitä kyselytulosten takaa löytyy.

Tutkimuksen löydökset osoittavat, että T-muotoisella kompetenssilla sekä monitieteellisillä taidoilla voidaan katsoa olevan hyötyä liike-elämässä. Monialaisuus ja monitieteellinen tiimityöskentely voi mahdollisesti tuoda merkittävää ylimääräistä rahallista arvoa liiketoimiin, ja parantaa myös innovaatiotoimintaa. Empiiriset tulokset osoittavat, että case-ohjelma tarjoaa jollain tasolla tarvittavat tiedot, taidot ja kompetenssin monitieteellisyyden hyväksikäyttämiseen liikemaailmassa. IDBM-valmistunut on pystynyt lisäksi käyttämään yliopistossa oppimiaan taitoja paremmin hyväksi työelämässä verrattuna muihin kauppatieteellisen ohjelman käyneisiin valmistuneisiin. Monialainen tiimityöskentely työelämässä voi luoda positiivista synergiaa, joka johtaa usein parempaan lopputulokseen. IDBM-ohjelman käyneellä on usein tarvittava T-muotoinen kompetenssi toimia menestyvänä projektijohtajana tällaisessa monialaisessa tiimissä. Ohjelmaa pidetään myös erittäin motivoivana ja opetuksen laatua erityisen korkeana. Huolimatta siitä, että kyseessä on johtamisen ohjelma, IDBM-sivuainekokonaisuus ei kuitenkaan valmista suhteellisesti enempää johtajia verrattuna muihin kauppatieteellisiin ohjelmiin. Vaikka tämä lopputyö osoittaa jonkin asteista korrelaatiota menestyksen ja monialaisen koulutuksen välillä, ilmiötä tulisi tutkia enemmän, jotta korrelaatiosta saataisiin luotettavampaa todistusta.

Avainsanat *IDBM, monitieteellisyys, poikkitieteellisyys, monialaisuus, T-muotoinen kompetenssi*

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Helsinki, September 2014

Pekka Sihvola

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1. INTRODUCTION

1.1. Background

The problems that occur in the current global and rapidly changing world are complex. To solve these complicated problems in their own field scholars and researchers must recognize developments, not only in their discipline, but also in other disciplines in order to not to miss any valid new information. In addition to becoming specialists in one specific area, they should become subspecialists in other disciplines. This requires scholars and researchers to collaborate with colleagues outside of their own discipline. The same applies to the business world – the need of multiply skilled employees has substantially increased. As scholars, researchers or employees consider questions from outside of their own disciplines or expertise, they may be able to avoid making mistakes that arise from a narrow perspective. They might also start to think about their own field in a new way.

To fulfill the educational needs and the business environments requirements educational institutions are constantly striving to develop study programs that aim to combine, integrate, mix or join disciplines in a fruitful way. Various programs as such have been initiated in universities all around the world in the last couple of decades. These kinds of program are usually called interdisciplinary programs (Repko, 2012); but also terms such as cross-disciplinary, multidisciplinary and transdisciplinary are used. The terms are defined and discussed later in this research. However, for the purposes of this thesis and to avoid misunderstanding, the term interdisciplinary is generally used from now on to describe such an integration of disciplines. In the business world and working environments a more common term is cross-functionality, which describes bringing people from distinct expertise or functions together to work toward a common goal.

Brint, Turk-Bicakci, Proctor & Murphy (2009) investigated interdisciplinary teaching programs in U.S. university institutions and found out that the number of such programs grew by nearly 250% between 1975 and 2000: from 674 programs in 1975-1976 to 1,663 in 2000-2001. It should be noted that this growth was not due merely to the increase in student enrollment, which grew only about 18 % during the same period. According to Strober (2010) the substantive and notable interest in interdisciplinarity began to increase towards the end of the 1990s in many research universities, private foundations and government agencies. Since then research universities have been even more active in promoting interdisciplinary work and many of the institutes have made interdisciplinarity a part of their strategy. For instance, Stanford University as well as the University of Southern California made interdisciplinarity research a strategic goal in 2004.

“Aalto University is all about cross-disciplinary projects and learning in practice” (Aalto University, 2014a).

The recently created Aalto University is another example of such an educational development. The initial aim of the university was to combine three universities from different disciplines

resulting in an institution internationally recognized for the impact of its science, art, and learning from multiple fields. This is planned to be conducted, for instance, by bringing people from distinct disciplines together in a natural context and environment.

Inside Aalto University there are programs whose students are selected especially and specifically from different disciplines; The International Design Business Management (IDBM) is such a program. It is a joint initiative of the Aalto University School of Business, the School of Art, Design and Architecture and the School of Science. The program was established in 1995. Until 2010 the IDBM program included only minor studies but since then it has become a possible major studies track as well. The minor program can be considered to be a multidisciplinary program, whereas the major program can be seen an interdisciplinary program (Koria, 2014). The differences are discussed more in the case program chapter. In this thesis, the term interdisciplinary program is used even though the empirical part of the thesis focuses on the minor program, as the core idea of the both program tracks is essentially the same.

In general, due to the multiple viewpoints interdisciplinary or such programs presumably offer they are considered to be beneficial in terms of the graduates' employability and success in their working careers. However, the empirical evidence of the real advantages of such programs is somewhat limited. This research aims to gain a better understanding of the issue.

1.2. Objectives

In the literature part it is shown theoretically that by implementing interdisciplinarity in studies or in businesses it is possible to achieve remarkable advantages. For instance, in theory interdisciplinary competence can provide more creative solutions in innovation work because the innovator is capable of discovering answers from several sources. However, the generic evidence and the empirical studies of the positive impact in the real world context are still somewhat limited. Hence, the main research question aims to answer whether the interdisciplinary education program in the university has had positive influence on the working career of the alumni. The supporting questions to facilitate the research are:

- Has the case program (IDBM) provided interdisciplinary competence for the students?
- Have the IDBM graduates implemented the interdisciplinary skills and knowledge learned from the program in their working life? If so, what has been the impact?
- What kind of significant differences can be found between all the business student graduates and IDBM business student graduates?

In addition to answering the research questions, another objective is to collect a reliable database of the IDBM alumni. The current 'marketing and sales pitches' of the program's quality are based more on faculty's anecdotal evidence and practical experiences, and lack solid empirical evidence. The thesis aims to discover evidence based on research data that the interdisciplinary program truly creates extra value for the students, thus justifying the program's claims.

The research is supported by the Aalto University, School of Business, IDBM department. The empirical data of the research is relatively wide, hence only the most important findings are processed and discussed in this thesis. The data of the empirical part can be utilized in further studies as well as for educational development purposes of the IDBM program. All the data can be found in the Appendices.

The research was conducted by executing an online questionnaire to the IDBM business student graduates. In addition, four in-depth interviews were conducted to gain a better understanding of what was behind the survey answers. The results of the questionnaire were compared to the findings of the two reference studies conducted by SEFE ry (Suomen Ekonomiliitto – Finlands Ekonomförbund) and Finnish Social Science Data Archive (FSD). The IDBM program was selected for the case study due to several reasons, such as the relatively long (in the Finnish University environment) history of the program and the reputation of the program to be one of the groundbreaking interdisciplinary programs in Finland.

1.3. The Scope and the Structure of the Thesis

After the introduction chapter the case program is introduced in Chapter 2. This includes a short history and the descriptions of the main objectives of the IDBM program. The main differences of the minor and the major programs are discussed, and the structure of the minor program is highlighted. In addition, the target and the control groups of the research are presented.

The overview of the case program chapter is followed by a literature review. The chapter is aggregated from academic literature and the previous research. The main aim of the literature part is to support the empirical work, but also to provide a compact information package about the concepts. In the beginning of the chapter, the skeletal version of the theoretical framework is introduced. After that, the model is completed and constructed step by step along the chapter, and at the end of the literature review the complete version of the theoretical framework is demonstrated. The first sections of the literature review chapter have a focus on the theory of knowledge and how disciplines have developed from general knowledge. It is important to understand what it means to combine or integrate disciplines in multi-, inter- or such a way. In the next section, the broad field of terminology is studied and the main differences are explained. Next the theory of the T-shaped competence is introduced. This is followed by sections that examine how to execute interdisciplinary education, for instance what are the elements that should be included or avoided. By now two of the building blocks of the theoretical framework of the thesis are introduced. These blocks create the educational background for the framework.

The next sections in the chapter examine what the theoretical advantages of interdisciplinarity in working life are, and this creates the other side of the theoretical framework. The working life examination is divided into four parts. Each of the sections forms one building block for the theoretical framework. The first part, cross-functional teamwork, is examined from the perspective of interdisciplinarity but also from the perspective of conventional teamwork theory.

The next building block concerns the diversity of knowledge the heterogeneous teams create and how to handle it. This is followed by the creativity and innovation building blocks, which are theoretically tightly connected to cross-functional teamwork and the diversity of knowledge.

Before the complete theoretical framework is introduced, the challenges and threats of interdisciplinarity are discussed. In the theoretical framework the most important literature findings related to the research questions are combined and highlighted in a comprehensible depiction. The theoretical framework is the foundation to which most of the empirical findings are compared to.

After the literature chapters the research methodology is examined in Chapter 4. This chapter discusses the research paradigm, the practicalities of the exploratory research, the suitability of the case study, and the implemented methods. In addition, the research process as well as the practical details of the questionnaires and interviews are introduced and depicted. At the end of the chapter the quality criteria, such as the validity and the reliability of the empirical part, are presented.

After the methodology, the main findings of the research are introduced. In this chapter the results of the questionnaire, the results of the reference studies as well as the main findings from the in-depth interviews are discussed. The objective of the questionnaire and the reference studies is to provide as many answers as possible to the what-questions, whereas the deep interviews aim to response the why- and how-questions related to the research problems.

The findings chapter is followed by the conclusion chapter. The chapter concludes and combines the most important theoretical and empirical findings, as well as provides answers to the research questions. The main task of this chapter is to summarize the most important findings and discuss them, but also to provide managerial implication suggestions. In addition, the possible further recommendations are provided, and the limitations of this research and the future perspectives are reviewed.

1.4. Glossary

Cross-disciplinarity: Depending on sources the term can mean several things, such as a synonym for multidisciplinarity, a viewing of one discipline from the perspective of another or a broad term covering all forms of contacts between or among disciplines encompassing all the other terms (multidisciplinarity, intedisciplinarity and transdisciplinarity).

Cross-functionality: The term commonly used in business world. Bringing people from distinct functions or disciplines to work on the same issue.

FSD – Finnish Social Science Data Archive: The executor of the Career and Employment Survey, where the purpose is to gain results about the career and employment history of the respondent. The survey is conducted career five years after respondent's graduation.

IDBM – International Design Business Management: A joint education program of the Aalto University School of Business, the School of Art and the School of Science. A minor program since 1995, a major or minor program since 2010. The program includes courses from all the three Schools and an industry project, which is a real-life assignment from a sponsor-company that a team of three to six students solves during one academic year.

Interdisciplinarity: Integrating, interacting, linking, focusing or blending interdependent parts of knowledge or disciplines into harmonious relationships.

I-Shaped Competence: Deep knowledge and expertise in a single field or discipline.

Multidisciplinarity: Juxtaposing, sequencing or coordinating interdependent parts of knowledge or disciplines into harmonious relationships

NPD – New Product Development: The complete process of bringing a new product or service to market.

SEFE – Suomen Ekonomiliitto: The executor of the Annual Questionnaire for Recent Graduates. The survey aims to discover what the respondent thinks about the university from he or she graduates and about the education the he or she received.

T-Shaped Competence: Deep knowledge and expertise in a single field or discipline (the vertical bar of the T), and skills to integrate and combine other disciplines, as well as the understanding of how a single field interacts with other disciplines (the horizontal bar of the T).

Transdisciplinarity: Transcending, transgressing or transforming interdependent parts of knowledge or disciplines into harmonious relationships.

2. OVERVIEW OF THE CASE

2.1. IDBM Program

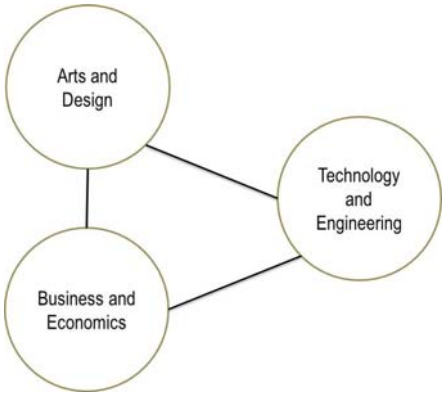

Figure 1. The combination of disciplines in IDBM program (Aalto University, 2014b)

The International Design Business Management (IDBM) is a joint education program of the Aalto University School of Business, the School of Art and the Schools of Science (Figure 1). The first IDBM students began their studies in the autumn of 1995. For the first fifteen years the program was only a minor program, but since 2010 it has also been possible to study IDBM as a major. Ten to fifteen students per year are selected from each participating school, making a total of thirty to forty-five participants annually. The total amount of the students depends on the need of the annual industry projects that are compulsory to all participants. The industry project is an essential part of the program. Since 1995 some 110 projects have been completed within the IDBM for a wide diversity of companies. Each project is completed by teams of 3 to 5 students and a project coach who is chosen from the universities to supervise the progress of the project.

"The purpose of the IDBM program is to develop world-class expertise in global design business management through multidisciplinary research and learning that cuts across the area of business, design and technology" (Aalto University, 2013)

As it is described above, IDBM program aims to utilize multidisciplinary education methods to create expertise across the area of business, design and technology. According to the program (Aalto University, 2013) IDBM studies prepare for work in the creative industries and in businesses that utilize creativity as competitive positioning. It is also suggested that the initial specialist roles usually evolve into managerial ones over time. The typical tasks that graduates undertake in their working career should be:

- doing and managing design, product, service and business development
- consulting business
- intra- and entrepreneurial initiatives and researches

The core idea in the program has remained somewhat the same during the 18 year history. The science and the education methods have naturally evolved over time but the main purpose to educate individuals with interdisciplinary knowledge and skills has not fundamentally changed.

However, reliable evidence that the program actually provides what it is initially intended to is limited. Hence, the demand for this research is well justified.

2.1.1. The Difference between Master and Minor Program

The general purpose of the IDBM program was discussed in the previous section. However, there are also differences between the minor and the master program inside the IDBM. According to Koria (2014) one of the core differences between the minor and the master program is the integration level of the disciplines. Thus, the line between multidisciplinarity and interdisciplinarity is crossed when moving from the IDBM minor program to the IDBM master program. This can also be seen in the program's webpage where the IDBM minor and the IDBM master programs are introduced (Aalto University, 2014b):

"Master's Degree Program in International Design Business Management aims to accelerate professional development in the global design intensive business by emphasizing the importance of design as a competitive factor…"

"The minor studies in International Design Business Management program build on the business, design and technology knowledge and competence achieved during previous studies, enabling students to make full use for their own potential and knowledge as members of interdisciplinary teams within project-based work."

As the master's program aims to accelerate professional development within IDBM, the minor program is built on the knowledge and competence achieved during previous studies. Therefore the division according to multidisciplinary and interdisciplinary program is reasonable and in accordance with the literature findings (see Section 3.3). Figure 2 illustrates a simplified difference between multidisciplinarity and interdisciplinarity, according to the National Academy of Sciences (2005). The positions of the IDBM minor and master programs are applied to the same figure.

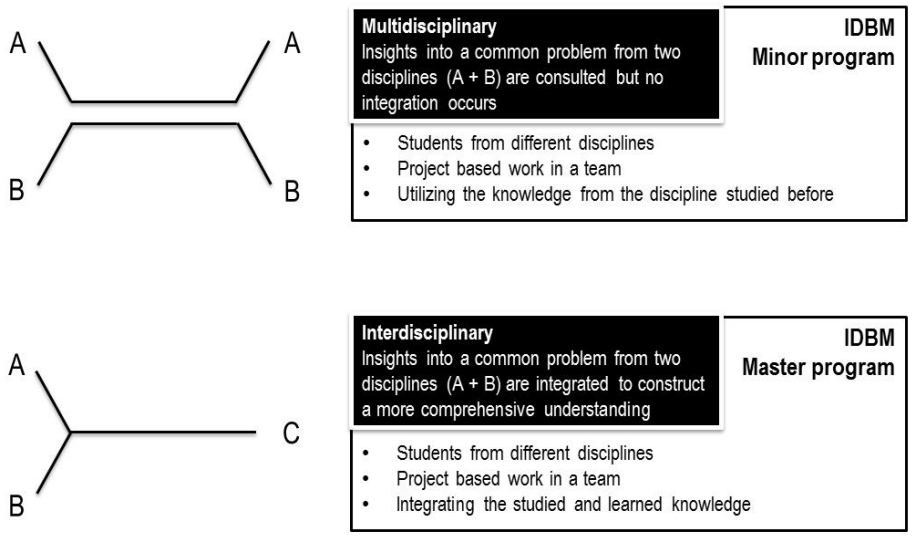

Figure 2. The difference between multidisciplinary and interdisciplinary (applied from National Academy of Sciences, 2005)

The differences between multi- and interdisciplinary, as well as other disciplinarities are discussed more in the literature review. However, as it was already mentioned in the introduction chapter, in order to avoid confusion and misunderstanding the term interdisciplinary is the main term that is used in this research even though the question concerns the minor program. This is because interdisciplinarity is the most commonly used term in literature.

2.1.2. The Structure of IDBM Minor Program

The basic structure of the IDBM minor program includes (Aalto University, 2014b):

- Compulsory Industry Project (extent 15 ECTS) + Compulsory Courses (extent 10 ECTS)
- Studies at School of Art, Design and Architecture, School of Business and/or Schools of Science (extent 9-25 ECTS)
- Altogether 24/30/40 ECTS (depending students' degree structure)

The compulsory industry project is described as follows: "Industry project is a real-life assignment from a sponsor-company that a team of three to six students solves during one academic year. The assignments range from developing brand and product strategies to scouting out future trends." (Aalto University, 2014b)

The IDBM minor program is intended for master level students only. The program is open for all the Aalto University students but students from other Finnish higher education Universities are warmly welcomed as well. Prerequisites for the program are bachelor's degree (or the ability to demonstrate equivalent knowledge of one's own field), the possibility to follow through a very intense program, and an interest in multidisciplinary teamwork. (Aalto University, 2014b).

2.1.3. Facilities

The program's main faculty is located in the Aalto University's School of Business in Helsinki. The educational activities of the program are divided among the three different campuses depending on the courses. However, there is also a specific space that has been developed to provide facilities for interdisciplinary working. It is called Aalto University Design Factor and locates in Otaniemi campus area in Espoo. Design Factory was opened in 2008, and since then it has been a natural working space for IDBM students. In addition to IDBM students there are several other students, researchers and business practitioners working there every day. Factory Director of Design Factory, Kalevi Ekman (2014) describes as follows:

"Design Factory is the symbiosis of the state-of-the-art conceptual thinking and cross-disciplinary hands-on doing. It leads a way towards a paradigm shift in education and business by providing a constantly developing collaboration environment for students, researchers and business practitioners."

2.2. The Target Group – IDBM Business Student Alumni

The target group of the research consists of the IDBM alumni business students who completed the IDBM minor program between 1995 and 2010, and graduated mostly between 1999 and 2013 (see Section 5.1). The prerequisite for the alumni was that they had to have graduated preferably few years ago, so as to be able to provide reliable answers related to the work life. Therefore, the time scale was limited to 2010 because not very many program participants after that have graduated, and even less have a few years of experience in working life. The target group was also limited to consist only of the business IDBM alumnus due to practical reasons. By limiting the alumnus to business students the data remained controllable enough and the scope did not expand too much. Even more important was the possibility to compare the results with the results of the control group (see Chapter 2.3), which consisted only of the business student graduates.

2.3. The Control Groups – Business Students

The questionnaire of the empirical part was constructed by using two separate reference questionnaires: Suomen Ekonomiliitto's (SEFE) annual questionnaire for recent graduates and the Career and Employment Survey conducted by Finnish Social Science Data Archive (FSD). The first reference survey aims to discover what the respondent thinks about the university from he or she graduated and about the education the he or she received. The purpose of the research is to facilitate the development of the activities of the universities, and the main focus is on teaching activities. In the latter survey the purpose is to gain results about the career and employment history of the respondent. The survey is conducted five years after respondent's graduation. Hence, the evaluation of the working career concerns the first five years in the business world. Even though the producer of this research is FSD, SEFE also publishes the main findings of the survey every second year. Therefore both of the reference questionnaires can be found in SEFE's reports (http://www.sefe.fi/tutkittua-tietoa).

The reason to follow the two reference questionnaires was to have comparable results if remarkable differences occurred. Hence, in this thesis the term control group is used to describe all the respondents from the two reference surveys. In the previous section it was explained that the target group of the research consisted of the IDBM alumnus who completed the IDBM minor program between 1995 and 2010. Due to this reason, the results from the reference surveys are also collected from the same period, or at least as close as possible. The details are explained in Section 4.4.

3. LITERATURE REVIEW

In this chapter the relevant literature related to the thesis objectives and research questions are reviewed. All the literature findings rest on reliable publications as well as on academically competent journals. The literature review composes the basis for the empirical part. In Figure 3 the simplified structure of the literature review is represented. It is the skeletal model of the theoretical framework. As the chapter proceeds, the model is constructed with the building blocks where the most important findings are summarized. At the end of the chapter the completed theoretical framework is introduced. To facilitate reading, each of the building blocks is marked with specific color.

The first part of the chapter (Education life in Figure 3) aims to discover the theoretical approaches to interdisciplinarity, how the interdisciplinary knowledge base for an individual should be constructed, and what the interdisciplinary education should be theoretically consisted of. It is also examined what kind of competence the knowledge base provides for working life. The latter part of the chapter reviews the advantages of interdisciplinarity from the working life perspective. That section aims to find out the best practices for working life to benefit from interdisciplinarity as much as possible.

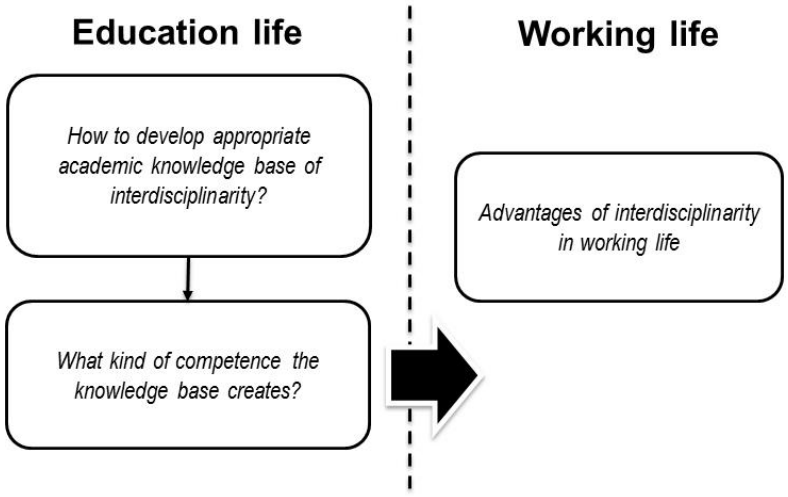

Figure 3. The skeletal version of the theoretical framework and the depiction where the literature review aims to discover answers

In the first sections of the chapter, it is discussed shortly and generally what is knowledge and how disciplines have evolved from general knowledge. After that, in Section 3.3, the taxonomy of disciplines is studied. The terminology is defined, and their relation to education is discussed. Based on the findings, the left part of the theoretical framework is created. The right part provides a deep understanding of the theoretical advantages of interdisciplinarity in working life. The goal is to discover theories and methods of how to transfer the presumable benefits of interdisciplinarity into practice. At the end of the chapter some of the challenges of interdisciplinarity are discussed.

3.1. Knowledge

Questions related to knowledge have occupied researchers' minds throughout history. Frodeman (2010) believes that knowledge can be compared to money: that one can never have enough of it but it can sometimes do more harm than good. The amount of knowledge data is infinite – nobody can ever master all the data, which indicates that it is impossible to constitute a unified theory or methodology of all knowledge. Thus, there has to be a system to somehow organize knowledge.

Due to the infinite amount of knowledge it is common and often reasonable to focus on a restricted number of knowledge fields. This means, in practice, becoming an expert in a certain intellectual field, in other words focusing on an individual discipline. Hence, disciplines can be considered a new organizational mode for the production and ordering of knowledge (Weingart, 2010). However, the origin of academic disciplines evolved from knowledge to some degree researchers distinguishes as can be seen in the following section.

3.2. Discipline

A discipline is often defined as an academic field of study, a profession subject or a major, such as biology, physics, chemistry or economics (Merriam-Webster, 2003). The definition of Klein (1990, p. 104) goes somewhat further by saying:

"The term discipline signifies the tools, methods, procedures, exempla, concepts, and theories that account coherently for a set of objects or subjects. Over time they are shaped and reshaped by external contingencies and internal intellectual demands."

An interesting and important note in the quote is that it emphasizes the changing and evolving nature of disciplines. According to Abbott (2001), the classification of knowledge by using distinct disciplines is necessary as they help prevent knowledge from becoming too abstract or overwhelming. However, he also points out that the division of different disciplines is not exact and might be overlapping. In many cases the knowledge might even originate from several disciplines, but discussed under one discipline.

Strober (2010) argues that the long-running history of academic disciplines starts from ancient Greece, the work of by famous philosophers, such as Plato and Aristotle. Aristotle divided knowledge into three categories: theoretical (including theology, mathematics, and physics), practical (including ethics and politics), and productive (including fine arts, poetics, and engineering). Philosophy was considered the branch of knowledge that would bring all other knowledge together. Later the development of science academies was fostered by famous scientists such as Galileo, Kepler and Newton. They further enhanced the idea that disciplinarity led to greater accomplishments.

Other researchers (e.g. Lattuca, 2001, Weingart, 2010), on the other hand, state that the emergence of disciplines in the modern sense took only place in 1800. According to Weingart (2010) in the end of the seventeenth century and throughout the eighteenth, collecting and ordering all available knowledge as well as the delineation and the systematic arranging of topics became all the time more popular. This resulted in the dramatic growth of science in terms of the amount of information produced and communicated, which caused problems of overload and integration. This is seen as the initial condition of disciplinary differentiation by Weingart (2010).

The first research university with disciplines that are familiar today was created in Germany in the end of the eighteenth century. However, it was not until the latter part of nineteenth century when the multiplicity of disciplines emerged. At the same time major American universities reconstructed their organizations into disciplinary departments creating discipline-based majors and graduate programs. (Strober, 2010).

Despite the modern and sophisticated discipline definition recognized by university faculties, even today the decision whether a field of knowledge is a discipline by using knowledge criteria is very complicated. For instance, it is very difficult to say whether statistics is an individual discipline or a just a branch of mathematics. The dividing lines among disciplines are inaccurate and in addition knowledge is constantly changing. Disciplines can be seen to be both categories of knowledge and categories in academic institutions (Strober, 2010) or social networks of individuals interested in related problems or ideas (Lattuca, 2001). This is described also by Turner (2000) as: "a field is a discipline if it meets two conditions: (1) it has departmental status across a large number of institutions, and (2) it has a market for new doctorates." This definition of disciplinarity is very explicit but, due to that it relies heavily on the politics and economics of institutions, in some respects this can also be seen as limited. However, because the focus on departments and doctoral training may facilitate the understanding of integrated disciplines such as interdisciplinarity (Strober, 2010), this definition is also applied in this research. The integration of disciplines is discussed more profoundly in the next section.

The emerging of (modern) disciplines in the early nineteenth century caused the unprecedented growth of science. Growth rates (usually measured in number of publications) continued at an exponential rate for almost 200 years and only started to level off in the 1980s. (Weingart, 2010). Thus the absolute understanding and knowledge of a single discipline is simply impossible – the existent knowledge related to the particular discipline is too extensive to completely understand for an individual.

All of us have some knowledge from several disciplines even though the traditional style of education is still based on becoming an expert in an individual discipline. As Turner (2000) describes, students typically become educated in the disciplinary contents and later they become accredited when they graduate successfully. Then the studied discipline is defended by their members, inside and outside universities, and the completed degree can be translated into career opportunities. However, as Frodeman et al. (2010) proposes, it is more and more important in the

current world to better understand the relations between the fields of knowledge, better sense the ways knowledge is produced in the academy and transferred to society, and better grasp the dangers and opportunities of constant knowledge production. Hence, as Strober (2010) states both disciplinary specialization (and subspecialization) and interdisciplinary work can be seen as critical to the continued advancement of knowledge, but also important in terms of career opportunities.

3.3. A Taxonomy of Disciplinarities

"Everybody always thinks it (interdisciplinarity) is a great thing, but nobody has figured out a way to make it work as a formalized, permanent structure" (Abbott, 2001, p. 215).

Taxonomy refers to classification of entities according to similarities and differences, whether they are, for instance, animal species, medical symptoms or artistic genres (Klein, 2010). Since the late nineteenth century, taxonomies of knowledge have been focused on disciplinarity that demarcates domains of specialized inquiry. However, over the latter half of the century the increasing number of interdisciplinary activities has supplemented and challenged the taxonomy. (Klein, 2010; Weingart, 2010).

The interaction, collaboration or integration between or among disciplines is discussed in several distinct ways. As Stember (1991) describes, collaboration between disciplines is conceivable in a variety of forms ranging from the intimate cooperation between two specialists to specially organized specialists supervised by complex administrative structures. Whichever is the collaboration, the executive driver is dissatisfaction with the compartmentalization of the disciplines and the productive expectations from the collaborative model. In his publication Finkenthal (2008) explains that during the history disciplinarian thinking has facilitated mankind to understand and control the world. However, he also adds that as the complexity of the phenomena under consideration has increased, it has become evident that some sort of inter, or cross-disciplinary approach has to be used to obtain a better understanding to the complex problems.

Interdisciplinary is probably the most used term and, as Repko (2012) states, it is also the umbrella term that is used to describe such integration or collaboration of disciplines. Attempts to define interdisciplinary work began in the 1930s and reached peak during the 1970s and 1980s (Lattuca, 2001). Currently several terms that are applied to indicate that two or more disciplines are being used to solve or create a problem, explore a problem, comment on a text, or teach a class (Strober, 2010) exist. This section aims to clarify and describe the main differences related to the terminology: *(intra)disciplinary, multidisciplinary, cross-disciplinary, interdisciplinary* and *transdisciplinary.*

3.3.1. Relations of the Terms

Strober (2010) provides an insightful culinary metaphor related to the terms. A disciplinary dish consists of only one food, for instance a potato. If we add sautéed peas and steamed carrots to the potato dish, we gain a multidisciplinary or cross-disciplinary dish. To become an interdisciplinary dish, the vegetables have to be integrated by cooking them together into a soup or tossing them into a salad. For the dish to be transdisciplinary, the individual ingredients should have to be no longer identifiable. For instance if the cooked soup were put through a blender, we would have a transdisciplinary soup. A similar kind of culinary metaphor is illustrated by Repko (2012): multidisciplinary studies can be compared to a bowl of fruit whereas interdisciplinary studies can be compared to a smoothie made from the same fruits.

The culinary metaphors may be comprehensible but unfortunately it is inadequate to distinguish types of knowledge in the real world, where it is not always obvious where the dividing lines between multidisciplinarity and interdisciplinarity or between interdisciplinarity and transdisciplinarity should be drawn (Strober, 2010). In Figure 4 is depicted a suggestion of the difference disciplinarities (Refsum, 2012).

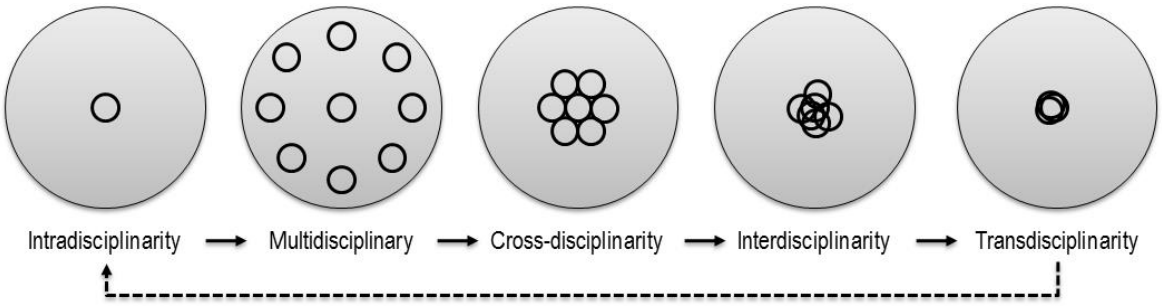

Figure 4. The relations and differences among disciplinarities (Refsum, 2012)

The depiction provides a visual relation about the terminology and their main differences. Despite the emphasized simplicity of the figure, it is very convenient for the purpose of quickly illustrating the main differences between the terms.

In the left end of the spectrum, at the base of the typology, there is disciplinary activity focused on working within one discipline, subject or area of knowledge. Focusing on one discipline is sometimes called intradisciplinarity (Stember, 1991). Disciplinarity and disciplines were already discussed earlier (see Section 3.2). In the following section the rest of the terms are discussed more profoundly.

3.3.2. Multidisciplinarity

As it was mentioned in the introduction chapter, the IDBM minor program can be considered as a multidisciplinary program. Multidisciplinarity is often confused to the other terms discussed in this chapter and the difference between multidisciplinarity and cross-disciplinarity even divides the scholars' opinions (see Section 3.3.3). What seems to be more explicit in literature is to distinguish multidisciplinarity from interdisciplinarity and transdisciplinarity. In the classification of

Organisation for Economic Co-operation and Development (OECD)(Apostel, Berger & Michaud, 1972), multidisciplinarity is defined as an approach that juxtaposes disciplines. The juxtaposing is supported by one of the most respected scholars in this field, Julie Thompson Klein (2010). According to OECD, this juxtaposition fosters wider knowledge, information and methods but the disciplines remain distinct. This indicates that disciplinary elements retain their original identity, and the existing structure of knowledge is not questioned.

The integration or interaction level of the disciplinary insights in multidisciplinarity divides the scholars' opinions. According to Szostak (2012) the attempt is not to integrate the disciplines. Also in CARDI's (Centre for Ageing Research and Development in Ireland, 2009) paper this is stated by saying that in multidisciplinary education academics from different disciplines work on the same subject but with little or no interaction. Stember (1991) highlights that in multidisciplinarity the benefits occur when a different perspective on a problem or issue is provided from several disciplines. Strober (2010), on the other hand, provides an example by saying: "when faculty members lecture sequentially in a class, each laying out his or her disciplinary insights and leaving it to students to integrate (or fail to integrate) the various frameworks, we have a clear example of multidisciplinarity". Hence, the author leaves the integration to the students. This reminds the situation in the IDBM minor program (see Figure 2).

3.3.3. Cross-disciplinarity

The two terms in Figure 4, multidisciplinary and cross-disciplinary, are discussed from few different perspectives in the literature. According to Strober (2010) multidisciplinarity and cross-disciplinarity are synonyms and indicate less integration of methodologies, theories, contents and perspectives than does for instance interdisciplinarity. As for Meeth (1978) and Stember (1991) state that cross-disciplinarity is a viewing of one discipline from the perspective of another and multidisciplinarity is a level higher and involves several disciplines that each provide a different perspective on an issue. Cross-disciplinary collaboration is also considered a main term, where multidisciplinarity, interdisciplinarity and transdisciplinarity are approaches to cross-disciplinary collaboration (Stokols, Hall, Moser, Feng, Misra & Taylor, 2010; Szostak, 2012) or a broad term covering all forms of contacts between or among disciplines encompassing all the other terms (CARDI, 2009). Due to the divergent opinions of scholars, no unambiguous definition for cross-disciplinarity can be created. Hence, in this thesis the use of the term is avoided and left aside.

3.3.4. Interdisciplinarity

According to Klein (2010), when the integration and interaction among the participants becomes proactive, the line between multidisciplinarity and interdisciplinarity is crossed. Stember (1991), on the other hand, states that in interdisciplinarity the integration of the contribution of several disciplines to a problem or issue is required, and that "the interdisciplinary integration brings interdependent parts of knowledge into harmonious relationships through strategies such as relating part and whole or the particular and the general."

In literature the term interdisciplinarity is also divided in both narrow and broad or wide senses (Stember, 1991; Newell, 1998). According to Newell (1998) the narrow sense fewer disciplines are typically involved and the communication is simplified. Narrow interdisciplinary occurs among disciplines with compatible methods, epistemologies and paradigms, such as history and literature. Broad interdisciplinary, on the other hand, is more complex and usually more disciplines and social sectors may be involved. It occurs among disciplines with little or no compatibility, such as humanities and science. The disciplines have different methods and paradigms. Another common approach to divide the term in the literature is generalist interdisciplinarity and integrationist interdisciplinarity (Repko, 2012; Moran, 2010). Generalist interdisciplinarity resembles the narrow sense. It perceives interdisciplinarity loosely to mean "any form of dialog or interaction between two or more disciplines" while minimizing, obscuring, or rejecting altogether the role of integration (Moran, 2010). In integrationist interdisciplinarity the integration should be the objective of interdisciplinary work because it addresses the challenge of complexity (Repko, 2012).

As it was discussed already in the introduction chapter, the term interdisciplinarity is the core term that is used in this study. The main advantages of all the terms are close to each other's (see Section 3.5), hence the research theory is mainly applied from interdisciplinary literature findings.

3.3.5. Transdisciplinarity

The next level in Figure 4 is transdisciplinarity, in which researchers integrate theories and methodologies, develop a shared understanding and language, and seek novel solutions to complex problems (CARDI, 2009). Repko (2012) points out that transdisciplinarity concerns that which is at once between the disciplines, across distinct disciplines and beyond all disciplines. The objective is to understand the present world better and to discover solutions for complex problems by drawing on and seeking to integrate disciplinary and stakeholder views on the basis of some overarching theory. Strober (2010), on the other hand, states that transdisciplinarity is at the other extreme (the other extreme is a single discipline) where two disciplines become a single discipline, as for instance when biology and chemistry forms biochemistry. In the OECD's typology transdisciplinarity is a common system of axioms that transcends the narrow scope of disciplinary worldviews through an overarching synthesis. Klein (2010) adds: "…since then, the term has proliferated, becoming a descriptor of broad fields and synoptic disciplines, a team-based holistic approach to health care, and a comprehensive integrative curriculum design driven by the keyword 'transcending'". However, as it is noted in td-net (Transdisciplinarity Net, 2013) there is no a general definition of transdisciplinarity that is valid in all contexts; a definition has to be selected that suits the given challenge.

As was discussed in the previous paragraph, the exact definition for the term is difficult to find. In addition, transdisciplinarity can be considered to be relatively close to interdisciplinarity. Hence, also this term is left somewhat aside, and the main focus is on interdisciplinarity. However, if

valuable theoretical findings related to transdisciplinarity are discovered, it is not avoided but applied to the theory of this thesis.

3.3.6. Taxonomy in a Nutshell

In Table 1 the main defining characteristics of the three main terms are summarized. The table is created by Klein (2010).

Table 1. Defining characteristics in typologies of interdisciplinarity (Klein, 2010)

Multidisciplinarity	Interdisciplinarity	Transdisciplinarity
juxtaposing	**integrating**	**transcending**
sequencing	interacting	transgressing
coordinating	linking	**transforming**
	focusing	
	blending	

In the table one of the characteristics is bolded in each of the columns. The bolded word is selected to shortly describe the term that it refers to. These terms are used in the empirical part in-depth interviews. Despite the lucid characteristics Table 1 provides, the lines between multidisciplinarity, interdisciplinarity and transdisciplinarity are sometimes difficult to draw (Strober, 2010). And as Stember (1991) stated, the term interdisciplinary can be more or less confusing and something of a misnomer. The terms multidisciplinarity and interdisciplinarity are also often used interchangeably and usually in the broad sense (Stember, 1991; Rogers, Scaife & Rizzo 2005). Interdisciplinary is the common umbrella term (of integrating disciplines) and the general purpose of integrating disciplines is to construct a more comprehensive understanding (Repko, 2012; Strober, 2010). Hence, as Strober (2010) concludes, it is understandable that the core idea among all the terms is similar: two or more disciplines are used to solve a problem and the collaboration or integration of the disciplines provides extra value compared to the value of the individual disciplines.

Due to the reasons explained in previous paragraph, the literature findings and theories which are studied and applied in this research are not only sources related directly to multidisciplinarity but also to interdisciplinarity, cross-disciplinarity and even transdisciplinarity. However, the applied theory is always observed from the program's perspective, whether it is suitable for the case program or not. And as it was validated earlier, the term interdisciplinarity is mainly used.

3.3.7. Interdisciplinary or Disciplinary Learning – either or?

"What universities should be doing is . . . thinking of lunatic, insane, crazy, ridiculous ideas, because they have the luxury of doing so; in the business world, you can't always do that because you may fail. Our job is to fail. We should be generating ten wacko, wild ideas a year . . . and if nine of them fail, we're doing our job. (Strober, 2012, p. 21-22)

The quote above describes one of the core purposes to develop interdisciplinary learning in universities. This is very close to the modern theory of design thinking, which is another widely discussed topic in the literature (see e.g. Hassi & Laakso, 2011; Holloway, 2009). Design thinking, as well as an interdisciplinary project, relates often to an innovation process, which aims to discover unmet needs and to create new product concepts (Lockwood, 2009). One of the main ideas behind design thinking is to have a license to explore possibilities and the willingness to take reasonable risks. Mistakes and failings are considered a natural part of the process and early failures through tryouts, prototypes and models are seen as a part of the strategy. (Hassi & Laakso, 2011; Holloway, 2009). Hence, this course of action is something that can be often easier conducted in universities than in the business world.

Thus, should the traditional disciplines be forgotten? There are references in the literature (see e.g. Page, 2007; Holtzman & Anderberg, 2011; Strober, 2012) that state that investing in research within a single field may be a relatively safe investment, but with possibly less potential for solving the major problems. Some researchers, on the other hand, suggest that investing in interdisciplinary research is riskier and that may not pay off at all but when it does, the payoff might be spectacular. (Strober, 2012). An extensive study related to this claim was conducted by Fleming (2004) who has investigated the relation of patents and the discipline distances of the group members who created the patent. The study is discussed more in Section 3.5.

However, as Strober (2010) states, from a cognitive perspective one cannot be interdisciplinary unless and until one has a thorough grasp of disciplinary knowledge. Also Klein (2005) and Derry & Schunn (2005) highlight the importance of developing both disciplinary expertise and interdisciplinary capacity to prepare one better for the current complex tasks and the problems that exist. Strober (2010) adds that due to the limited funds and resources, both disciplinary and interdisciplinary research should be supported to achieve the maximal common benefit.

In conclusion it can be said that both, disciplinary and interdisciplinary, are important in current universities. Traditional disciplinary education provides important general knowledge and typically relative valuable results. Interdisciplinary education on the other hand provides knowledge from new territories and is a possibility to discover something remarkable novel. The students in the case program have conducted their higher education precisely in this way. They have developed their disciplinary expertise based on a separate major but also created an interdisciplinary capacity by conducting IDBM minor program.

The unanswered question is whether more integration of interdisciplinarity is better than less? This is also widely discussed in the literature (e.g. Repko, 2012; Rogers et. al 2005; Strober 2010;). According to Strober (2010) in teaching there is evident value in assisting students to integrate perspectives from multiple disciplines to avoid the limitations of any single discipline. However, in their studies Rogers et. al (2012) provide also critique towards integrating perspective, in other words toward inter- or multidisciplinarity when creating new knowledge. They found out that important new developments have emerged even though the field has remained multidisciplinary

rather than interdisciplinary, and researchers continue to use methods and constructs from their own disciplines. Hence, there is no best practice for what is the right amount of integration in interdisciplinarity.

3.3.8. T-Shaped Competence

I-shaped competence refers to the deep knowledge a person has where as, T-shaped competence refers to both, the deep and broad knowlede that an individual has. T-shaped compentece is a theory model related to the discussion in the previous section, of how to construct a competitive competence by not only focusing on a single discipline. The vertical bar on the T represents the deep knowledge and expertise in a single field or discipline, whereas the horizontal bar represents skills to integrate and combine other disciplines as well as the understanding of how the single field interacts with other disciplines. (Lee & Choi, 2003; Iansiti, 1993). In Figure 5 the T-shaped competence is depicted graphically.

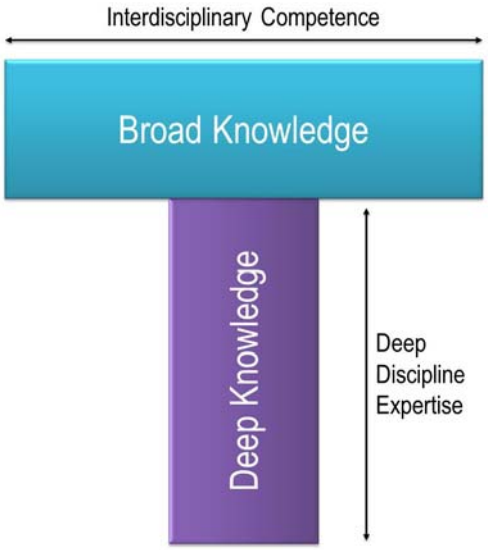

Figure 5. The depiction of the T-shaped competence (adopted from several resources e.g. Leonard-Barton, 1995; Oskam, 2009)

It is suggested that the earliest reference of the T-shaped theory is by David Guest in The Independent in 1991. In his publication Leonard-Barton (1995) provided one of the first figures of the T-shape. Since then the T-shaped concept has been widely discussed in several contexts, such as engineer education (Oskam, 2009; Wu, Zou, Kong, 2012), innovation (Johannessen, Olsen & Olaisen, 1999; Oskam, 2009), new product development NPD (Madhavan & Grover 1998) and R&D (Iansiti, 1993). In each of the contexts, T-shaped competence and skills are considered to be beneficial. For instance, Madhavan & Grover (1998) propose that “the T-shaped skills…are key design variables when creating NPD teams”.

The term is also familiar in the business world. For instance, Tim Brown the CEO of IDEO, one of most innovative companies in the world by Boston consulting group (IDEO, 2014), has emphasized many years the importance of the T-shaped competence. Brown underlines in Hansen’s (2010) interview the importance of empathy because it allows people to imagine the problem from

another perspective, which is, for instance, especially important in brainstorming. In addition the T-shaped persons tend to get very enthustiac about other people's disciplines to the point where they may actually start to practice themselves.

According to Leonard-Barton (1995) people with T-shaped skills in the business world are extremely valuable, especially for creating knowledge. This is due to that they can integrate diverse knowledge assets. Johannessen, Olsen & Olaisen (1999) add that these kind of people have the ability to both combine theoretical and practical knowledge, and more importantly to see how their field of knowledge interacts with other fields. Hence, these kind of people can expand their competence across several functional branch areas, and this way create new knowldege.

In their study Future Work Skills 2020 Davies, Fidler & Gorbis (2011) listed transdisciplinarity as one of the key skills needed in the future workforce. Several other authors (see e.g. Finkenthal, 2008; Frodeman, 2010) state that many of today's global problems are just too complex to be solved by one specialized discipline and require transdisciplinary solutions. Therefore the ideal worker of the next decade, according to the authors, is T-shaped, who has "deep understanding of at least one field but the capacity to converse in the language of broader range of disciplines". They add that this requires a sense of curiosity but also a willingness to go on learning far beyond the years of formal education.

Based on the findings of this section, it can be concluded that the T-shaped competence can be considered very advantageous in working life. Hence, by acquiring the T-shaped compentence, in other words an appropriate combination of knowledge, for instance from a university, a person is more prepared to solve the complex problems of the current business world.

3.3.9. Theoretical Summary of Disciplines and the Taxonomy of Disciplinarities

This section summarizes the core findings from the literature so far. Figure 6 shows the theoretical perspectives of the T-shaped competence. The first block in the figure refers to the disciplinary (or intradisciplinary) learning in one field of study, profession subject or major. The blocks under the disciplinary learning describes the taxonomy of disciplinarities, in other words a theory, method or practice to interact, collaborate, combine or integrate two or more disciplines. It depends on the situation and the circumstances what kind of integration is the most appropriate. However, disciplinary learning together with one of the interdisciplinarities creates the T-shaped competence, which is the first building block of the theoretical framework. The blue box in Figure 6 provides the theoretical basis for an individual to benefit from interdisciplinarity in working life. According to literature, this kind of theoretical approach is considered to be valuable and beneficial in terms of solving the complex problems of the current world.

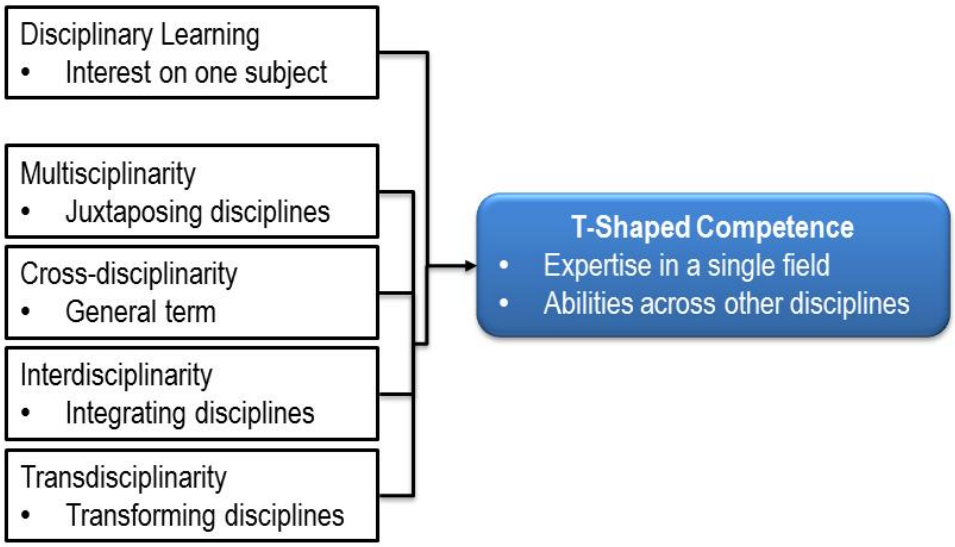

Figure 6. The creation process of T-shaped competence

3.4. Interdisciplinary Education

In this section the goal is to discover how interdisciplinary education should be constructed to provide the T-shaped competence for the students. First the current key conditions for successful interdisciplinary education are examined and discussed. At the end of the section they are summarized and the second building block of the theoretical framework is created.

"Interdisciplinary studies is a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline, and draws on the disciplines with the goal of integrating their insights to construct a more comprehensive understanding (Repko, 2012, p. 16)."

As it was discussed in the introduction chapter the interest in interdisciplinary education programs has increased during the 20th century and accelerated in the last couple of decades. The best practices and methods to execute such a program or integrate it to the whole studying program are also widely discussed (see e.g. Page, 2007; National Academy of Sciences, 2005; Repko, 2012). As it was summarized in the previous section, the current educational environment favors an expertise on a single field and abilities across other disciplines. The first is often traditionally organized among faculties, but the practices how to create an optimal environment for the latter is more complicated. This section aims to clarify the issue.

One notable initiative to provide understanding to the issue was conducted by the National Academy of Sciences (2005), which created The Committee of Facilitating Interdisciplinary Research. The committee's members were drawn from government, academy and industry, and they had a long experience in leading and performing interdisciplinary research. Based on committee interviews the key conditions for successful interdisciplinary research are listed in Table 2. The case program with the industry project is more or less interdisciplinary research, despite being only a one-off study program for students. The continuity (annuality) of the

program, the permanent faculty employees and researchers as well as the constant aim to improve the program signifies on a larger scale that the series of the program can be considered an interdisciplinary research process rather than only an individual interdisciplinary project.

The four aspects of the key conditions are discussed in the following sections. In the table the most relevant conditions in terms of the case program are highlighted (bolded). They are based on the literature but also on the author's own experiences of the case program and on the discussions with the program faculties.

Table 2. Key conditions for successful interdisciplinary research (IDR) (National Academy of Sciences, 2005)

Aspect	Key Conditions
Initial Stages:	• Common problem(s) to solve
Building Bridges	• Leadership
	• Environment that encourages faculty/researcher collaboration
	• Establishing a team philosophy
	• Seed/glue money
	• Seminars to foster bridges between students, postdoctoral scholars, and PIs at the same institution
	• Workshops to foster bridges between investigators at different institutions
	• Frequent meetings among team members
	• Think of the end at the beginning
Supporting the Project	• Science and engineering PhDs trained in research administration
	• Support project initiation and team building
	• Seamless and flexible funding
	• Willingness to take risks
	• Recognize potential for high impact
	• Involvement of funding organization
Facilities	• Physical co-location of researchers
	• Shared instrumentation
	• Enhance chance meetings between researchers, such as on-site
Organization/ Administration	• Matrix organization
	• Rewards for academic leaders who foster IDR
	• Tenure/promotion policies for interdisciplinary work
	• Utilize experts with breadth and IDR experience for assessment
	• Professional recognition of successful practitioners of IDR

3.4.1. Initial Stages

In Table 2, according to National Academy of Sciences (2005) the initial stage of the successful interdisciplinary research is described as a *bridge building* phase. This term is very common in the literature but also other terms such as *boundary crossing, mapping* and *bilingualism* are used. These terms are mainly used to find the right metaphor to visualize what you are attempting to do but each of them has also their limitations (Repko, 2012).

Repko's (2012) *bridge building* metaphor connotes the borrowing of tools and methods from disciplines. He adds that bridge building metaphor describes interdisciplinary activity as

something that takes place between two disciplines and has an applied orientation. However, he also argues that the limitations of the metaphor relate less to the interest concerned with the knowledge, perspectives, concepts, assumptions, theories, and methods of those disciplines relevant to the problem under investigation, than with the construction of a theory that would connect the disciplines. In this sense the same metaphor provided in Table 2 is more comprehensive, taking for instance the common problem into consideration.

As Klein (1996) describes *crossing boundaries,* people work directly and through institutions to create, maintain, break down, and reformulate boundaries between knowledge units. Repko (2012) adds that boundary crossing is the process of moving across knowledge formations for the purpose of achieving an enlarged understanding. He also describes that boundaries exist in many forms, including for instance political, economic and social, but also between academic disciplines. In terms of interdisciplinarity the metaphor of boundary crossing is useful as it emphasizes the way that disciplines have historically staked out their differences, claims, and activities, but also have built institutional structures to define and protect their knowledge practices. Again for interdisciplinarians the primary reason for crossing boundaries is to develop a more comprehensive understanding of a problem that would be impossible from the perspective of a single discipline.

The main idea behind *mapping* a problem is breaking it down into its component parts and seeing how these parts behave and relate to one another. The main idea behind the metaphor is that the carving up of knowledge space is like the practice of cartography or mapmaking. Mapping is an important strategy used by disciplinarians and interdisciplinarians to analyze complex problems. (Repko, 2012). According to Klein (1996), the usefulness of mapping is that it reveals new interdisciplinary fields, but also the extent of border crossing between disciplines. However, as Repko (2012) states, there are also weaknesses the mapping metaphor. For instance the mapping compares knowledge (which is fluid) to land (which is more stable), and maps necessarily emphasize some aspects over others.

The last metaphor, *bilingualism* is a common metaphor for interdisciplinary work that implies mastery of or proficiency in two complete languages. The main idea behind the metaphor is that it compares disciplines to foreign languages; for many developing proficiency in a foreign language is as difficult and time-consuming as developing proficiency in a new discipline. The problem in the metaphor is that it assumes that one cannot work in a new discipline without mastering it. (Repko, 2012). However, mastering the discipline is not the requirement; rather communicative competence is a condition for the possibility of interdisciplinary work (Klein, 1996).

All of the key conditions mentioned in Table 2 are important when it comes to the initial stages of interdisciplinary research. However, the three highlighted conditions are considered to be the most relevant and important when it comes to the case program. The main problem where to focus on should be common. Naturally members from different disciplines may focus on certain

sub-problems during the process, but the core objective and the main problem should be more or less definite for all the members. The second highlighted condition relates to the environment that encourages collaboration. This is important because the collaboration, as the initial purpose of interdisciplinarity, can provide wider viewpoints to the problem. The final highlighted condition in the initial stage relates to the point of view that the end should be thought of already at the beginning of the process. This does not mean that the final outcome, product or service is crystal clear at the beginning of the project, but rather it would make sense to consider what could be the possible consequences of the interdisciplinary project, what kind of process to execute and what would be the solution it provides.

3.4.2. Interdisciplinary Project

Interdisciplinary working is often project-based, involving participants from different disciplines to focus on the same issue or problem. In Table 2 some of the key conditions to a successful interdisciplinary project were listed. From the list the internal (team building) and external (administration) support for project, the willingness to take risks and particularly the recognizing the potential for high impact could be highlighted. The potential high impact is one of the most common drivers for an interdisciplinary project (Strober, 2012; Holtzman & Anderberg, 2011). However, as it can be seen later (see Section 3.5) the high impact can be difficult to achieve.

Already Birnbaum (1977) developed a set of indicators to determine the extent to which a project meets the criteria for interdisciplinary research. According to his studies these indicators are:

1. different bodies of knowledge are represented in the research group
2. group members use different problem-solving approaches
3. members of the group perform different roles in solving problems
4. members of the group work on a common problem
5. the group is responsible for the final product
6. the group shares common facilities
7. the nature of the problem determines the selection of group members
8. members are influenced by how others perform their tasks.

Burke, Herrman, Evans, Cockram & Trauer (2000), on the other hand, investigated multidisciplinary teamwork in health care and discovered that effective teamwork is supported by key factors including agreed goals, an agreed plan, effective communication styles, clear team roles, and competent leadership. The same paper suggests that the advantages of collaborative teamwork are continuity of care, the ability to take a comprehensive view of the case, the availability of a range of skills, and mutual professional support and education.

Teamwork is discussed in more detail later (see Section 3.5.1) but already at this stage it can be concluded that effective and well-constructed teamwork is an essential key factor for successful interdisciplinary working.

3.4.3. Facilities

In Table 2 only a few conditions related to the facilities are listed. The “big picture” of the facilities implicates to a space or spaces where working together with people from different disciplines is natural, practical and functional. The highlighted condition indicates to the increased possibility to meet colleagues, researchers or other important people by chance. It was also mentioned in the previous section that it is important for an interdisciplinary research group to share common facilities. Hence, the importance of the functioning facilities cannot be ignored.

In the introduction chapter it was described how Aalto University’s objective is to create an environment and facilities where people from distinct disciplines meet naturally. The goal is that the interdisciplinary intercourse between the students would engender something valuable compared to the “normal” disciplinarian faculties. The objective is not yet completely achieved, for instance the common campus area is not put into action until in 2016 (Aalto University, 2014a). However, Aalto University Design Factory is an excellent example and first step inside the Aalto University of a successful facility, which target is to bring students from different background together (see Section 2.1.3). Design Factory provides facilities for interdisciplinary working. It is a place that also enhances chance meetings between researchers and includes for instance a joint used kitchen, which can be compared to a site-on cafeteria mentioned in Table 2.

3.4.4. Organization and Administration

The last element of the key conditions relates to organization and administration. Without an appropriate organization and a functioning administration, the success of the interdisciplinary research/project is difficult to achieve. According to Strober (2010) it may be that administrators’ encouragement of interdisciplinarity is in part an effort to get hands on new sources of funds, or they may be hoping to transfer some power away from departments. More likely most administrators aim to seek some changes at the margin, a shift in the balance between specialized disciplinary work and interdisciplinary collaboration.

Whichever is the encouragement of interdisciplinarity, the organization as well as administration has to enable and to support the interdisciplinary work. In Table 2 there are two highlighted conditions for this: the utilization of the assessment conducted by the experts with interdisciplinary research experience, and the professional recognition of successful practitioners of interdisciplinarity. The utilization of the experts with interdisciplinary experience may facilitate the executing of the project but also help members to avoid common mistakes. In the case program this is executed in several ways, such as by having each of the project teams supervised by a faculty member (researcher) with interdisciplinary experience. The professional recognition of the practitioners, on the other hand, is important to encourage students, researchers or workers to select interdisciplinarity as their main option. The professional recognition for the case program can be seen to exist due to the relatively long history and the established reputation.

3.4.5. Summary of Interdisciplinary Education

The main findings related to interdisciplinary education are summarized in this section. The initial idea was to create "best practices" from the literature how to develop and execute interdisciplinary education. Best practices are usually open to interpretations, and they depend often on the situation, organization and environment. However, some recommendations about the high-quality interdisciplinary education can be provided and they are introduced in Figure 7. In the empirical part it is tested whether the case program includes these "best practices" or not. The green box in the figure is the second building block for the theoretical framework. As the blue box, t-shaped competence, provides the theoretical building perspective to the theoretical framework, the green box is the practical perspective.

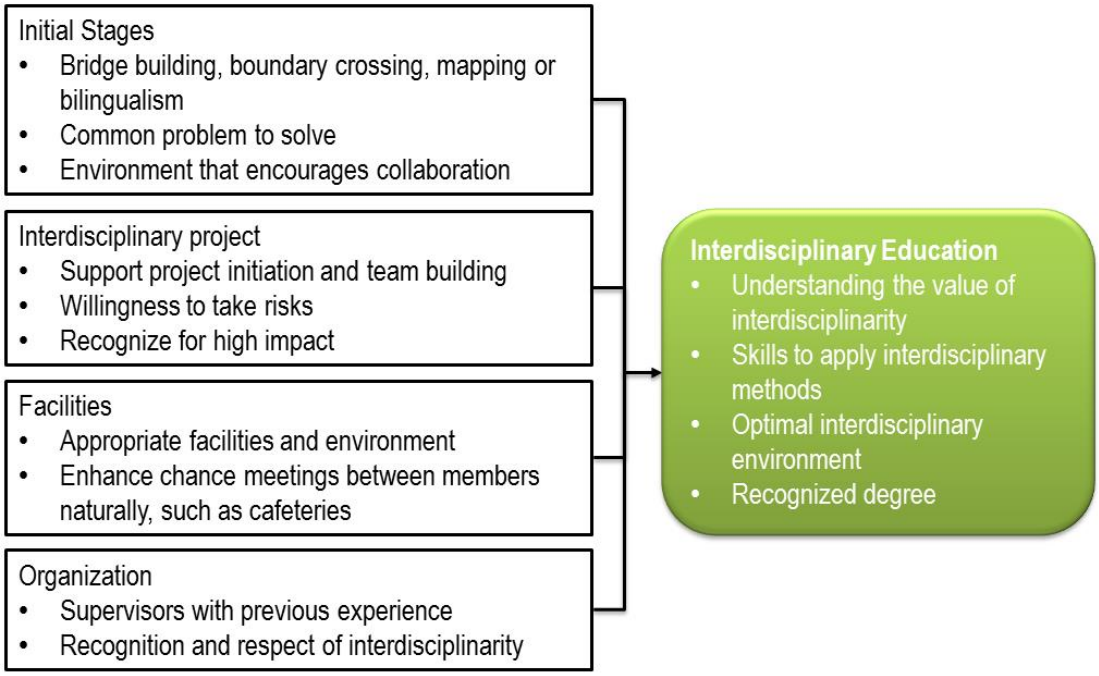

Figure 7. The characteristics of high-quality interdisciplinary education

High-quality interdisciplinary education building block (practical), together with the T-shaped competence (theoretical) (see Figure 6) building block, forms the basis and the abilities for an individual to benefit from interdisciplinarity in working life. The combined blocks are depicted in Figure 8. The blue box provides the theoretical perspective as for the green box, which provides the practical perspective. The following section provides a thorough examination of the theoretical framework's next step, the advantages of interdisciplinarity in working life.

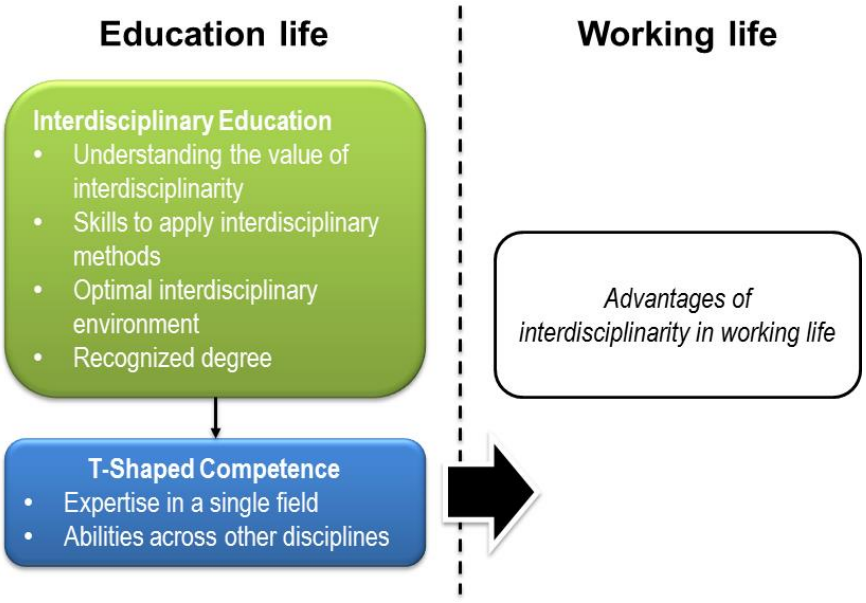

Figure 8. The basis for an individual to benefit from interdisciplinarity in working life

3.5. Advantages of Interdisciplinarity

Some of the advantages of interdisciplinarity have been discussed and mentioned directly or by implication already in the previous sections. In this section the most important advantages of interdisciplinarity are introduced more precisely and summarized. It is not only focused on the advantages of interdisciplinarity in the academic world, but the investigation is extended to the business world and working life. The most important findings are highlighted and later applied in the empirical part.

In literature several general fundamental beliefs that motivate an increase in the interest in interdisciplinarity can be observed. According to Strober (2010), the complex problems that occur in the current world require collaboration from multiple disciplines. In addition, she adds that crossing disciplines promotes creativity and hence increases the pace at which knowledge can move forward and thus increases the possibility that solutions will be innovative. This is discussed more in Section 3.5.3. In the publication of National Academy of Sciences (2005) four driving forces to interdisciplinarity are: the inherent complexity of nature and society, the drive to explore the interfaces of disciplines, the need to solve societal problems and the stimulus of generative technologies. Weingart (2010), on the other hand, suggest that theoretically two reasons could explain the emergent interest of inter- and transdisciplinarity. First, the growing number of specialties in research fields increases the probability that new recombinations will occur, which will result in new 'interdisciplinary' research fields. Second inter- and transdisciplinary research fields are promoted in the interest of directing research to politically desired goals. Both of these reasons can be assumed to be accurate in the business world as well.

However, the empirical evidence, which would indicate that interdisciplinarity (or multi/transdisciplinarity) provides significant extra value compared to the traditional disciplines, is less common. Weingart (2010) describes the issue that the replacement of a discipline-based

mode of knowledge production by an interdisciplinary mode is not often corroborated by empirical data. However, some empirical evidence of the interdisciplinary advantage or benefits exists.

In economic environment cross-functionality is a common used term and a cross-functional team (CFT) is a method to bring a group of people with diverse functional expertise to work toward a common goal (Krajewski & Ritzman, 2005; Dinca, 2013). Hence, the concept can be compared to interdisciplinarity where the core idea is similar (see Section 3.3.4). Bunduchi (2009) has created a theoretical model to link CFT, the advantages of diversity, creativity and innovations. According to her studies the use of cross-functional teams increases creativity in new product development (NPD) leading to shorter development time and higher product innovativeness. The advantage of the CFT is mainly caused by great information volume and diversity that people with different expertise can provide. The model is represented in Figure 9.

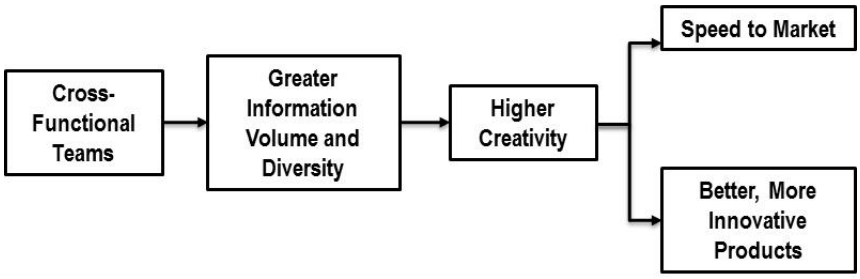

Figure 9. The relation between CFT and innovations (Bunduchi, 2009)

This model forms the basis for the advantages of interdisciplinarity in working life (see Figure 3 and Figure 8), the right section of the theoretical framework. In the following sections the elements of the model are discussed more profoundly, the model is further processed and applied to the theoretical framework of the thesis.

3.5.1. Teamwork

The interest towards producing knowledge by utilizing group- and teamwork has been rapidly increased in the last decades in both the academic and business world. Wuchty, Jones & Uzzi (2007) investigated 19,9 million papers over 5 decades and 2,1 million patents to demonstrate that teams increasingly dominate solo authors in the production of knowledge. According to their study research is increasingly conducted in teams and teams typically produce more frequently cited research than individuals do. The results were detailed for sciences and engineering, social sciences, arts and humanities, and patents, suggesting that the process of knowledge creation has fundamentally changed. They also found out that teams now produce exceptionally high-impact research, even where that distinction was once the domain of solo authors.

Teams can bring significant value to an organization if they are used in the right way. However, if the teams are done wrong they will hinder company performance as well as burden the company economically. (Holtzman & Anderberg, 2011). For a team to be successful, certain core characteristics are required. According to Holtzman & Anderberg (2011) the critical success

factors for teams are: *competence, common goals and clear performance metrics, commitment to a common goal, contribution from every member, a supportive environment* and *importance of alignment.*

Competence refers to that to succeed the team should have all the talent, knowledge, organizational clout, experience, and technical know-how needed to be an effective team. The second critical factor states that a team should have *common goals and clear performance metrics*. This is due to that a team without performance metrics cannot determine whether it has been successful or not. In practice it is impossible to succeed if team members cannot clearly articulate a clear and common goal. This leads to the next factor which is *commitment to a common goal.* A shared understanding of the goal is important but the team members should also be committed to the goal. Understanding of the goal assures that the team members know the direction of the work, whereas commitment motivates the team members to work and to keep working when problems occur. The next critical factor relates to the *contribution from every member.* This factor refers to that every member in a team should contribute his/her maximum effort and their performance depends on everyone pulling and contributing for the same unified goal. In other words, free riders in a team should not be accepted. It is also very important to have *a supportive environment.* In practice a team is a small organization embedded within a larger environment of operating units and functional departments. The level of supportiveness by operational units and departments is bound to have an impact on team effectiveness. Especially important is to consider leadership support, nonhierarchical team structure, appropriate reward system and experience with team-based work. The last critical factor for team effectiveness is the *importance of alignment* of the team. Alignment refers to the coordination of plans, effort, and rewards with the highest goals of the organization. When alignment is conducted properly, everyone in the organization understands both the goals of the company and the goals the team. In this kind of organization people work in the right direction but also the rewards system encourages them to do so. (Holtzman & Anderberg, 2011).

As it can be seen, these critical factors are very close to the key conditions for successful interdisciplinary research presented in Table 2. Strober (2010) explains that the argument that scholars and researchers from multiple disciplines are more creative than those from a single discipline comes from the idea that thinking of categories of ideas, as opposed to number of ideas, about a problem enhances creativity. Hence, when the team members are diverse in terms of education, experience, perceptions, and point of view, and are asked to process a problem, they come up with a greater number of these categories. This increases their fluency, flexibility, and originality. Strober (2010, p. 21-22) continues that "The case for interdisciplinarity among experts is that because their collective expertise is more diverse than that of any individual expert, interdisciplinary groups have the potential to more readily apply concepts across knowledge realms."

There are several other studies that propose the same kind of suggestion that interdisciplinarity enhances the creativity in teams (e.g. Gaspersz, 2007; Holtzman & Anderberg, 2011). However, as Klein (2005) states, for many the word interdisciplinary has become synonymous with teamwork. She adds that obviously this is not the case, but the increased interest in collaborative and integrative skills has reinforced the connection. However, according to Holtzman & Anderberg (2011) teamwork increases value in NPD processes. They conclude that if a team has members from various different backgrounds and skill sets a higher level of performance can be achieved. The author's also believe that heterogeneous teams present greater opportunities for success than do homogeneous teams, and that the likelihood of producing breakthrough innovations increases as moving from homogeneous to heterogeneous. In this connection homogeneous are characterized by having individuals with similar strengths and competencies, whereas heterogeneous refers to a group of individuals with a diverse set of skills, talents, and experiences. In Section 3.5.2 the argument is discussed more and empirical evidence is introduced. However, it can be concluded that according to several studies, teamwork and especially cross-functional teams are beneficial in working life and especially in NPD. In Figure 10 the next building block of the theoretical framework is presented. The core of the building block is from Bunduchi's (2009) model (see Figure 9) and it is further specified from the findings of this section.

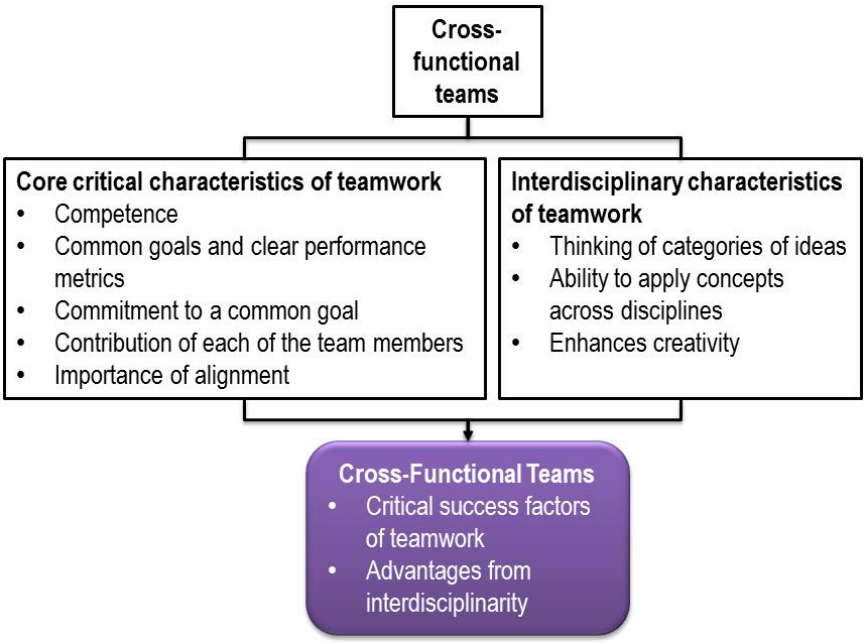

Figure 10. The characteristics of advantageous cross-functional teamwork

As it will be described in Section 3.5.3, also creativity can be remarkably beneficial to an organization. Combining with the findings of this section leads to an assumption that creative teamwork is especially beneficial to an organization. Could this assumption be further developed and conclude that integrated interdisciplinarity with creativity and teamwork can lead to a superior result? This is discussed more in the following section.

3.5.2. Alignment of the Team Members' Disciplines/Functions

As it was discussed in the previous sections cross-functional teams typically generate creative ideas and thus, potentially innovations. A survey of 32 executives and department managers conducted by Holtzman & Anderberg (2011) show that 84 percent of business leaders prefer to construct and utilize heterogeneous teams instead of homogeneous ones. They believe that heterogeneous teams are advantageous because they lead to multiple viewpoints and ideas, leading to innovative and creative solutions. Similar results are discussed by other scholars as well. For instance, it is suggested by Strober, 2012 and National Academy of Sciences, 2005 that investing in research within a single field may be relatively safe investment, but with possibly less potential for solving major problems, whereas investing in interdisciplinary research is riskier and may not return at all but when it does the output might be extremely valuable. Page (2007), on the other hand, has investigated the relationship between cognitive diversity and success in problem solving. According to him, cognitive diversity, which means differences in perspectives, heuristics, categorizations, and predictive models, can improve performance at problem solving. However, he also states that there is a high variance in outcomes and often this high variance is caused by the fact that many people who engage in groups with cognitive diversity are inexperienced in such interactions. At its best, when the interactions work well, there is benefit, at worst there is none. Therefore, the possibility to gain the benefit exists if the participants in the team can figure out how to do it.

Fleming (2004) brought the idea of alignment of the team members' disciplines somewhat further in his studies. He investigated more than 17,000 patents to discover what the financial values of the innovations created by different kinds of teams are. In the Figure 11 the theory of Fleming (2004) is depicted graphically.

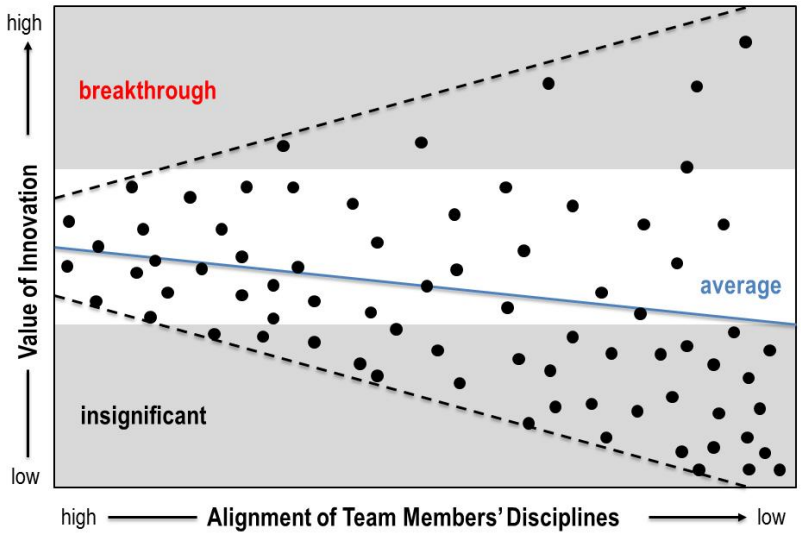

Figure 11. The relation between the value of innovation and the alignment of team members' discipline (Fleming, 2004)

In the theory, the relationship between the average value of a team's innovations and the similarity of the disciplines represented in the team is inverse. In Figure 11 each dot represents an

innovation and the blue line is the average value of the innovation. As it can be seen, the average financial value of innovations created by a team, where the members' disciplines are close to each other's, is relatively high while the variation around that average is low. In other words, this means that not many failures are seen but also the extraordinary breakthroughs are lacking. On the other hand the average financial value of innovations created by a team whose members' fields or disciplines are far from each other's is lower compared to a conventional team, a siloed approach. As a conclusion, as the distance between the team members' fields or disciplines increases, the overall quality of their innovations falls. However, at the same time the uncommon breakthroughs that occur from such interdisciplinary work are frequently of unusually high value – much more valuable than the best innovations achieved by conventional approaches. This supports and substantiates the assertion mentioned in the previous sections, that if the team has members with diverse sets of backgrounds and skill sets the likelihood of producing breakthrough innovations increases (Holtzman & Anderberg, 2011).

The next component from Bunduchi's (2009) model is greater information volume and diversity. That theory was disassembled in this section and specified to the thesis' theoretical framework. Hence, the pink box in Figure 12 is the next building block of the theoretical framework, and it is simply named diversity of knowledge. The figure summarizes how to actually benefit from team members with different backgrounds and what are the possibilities and risks if the alignment of team members' disciplines increases.

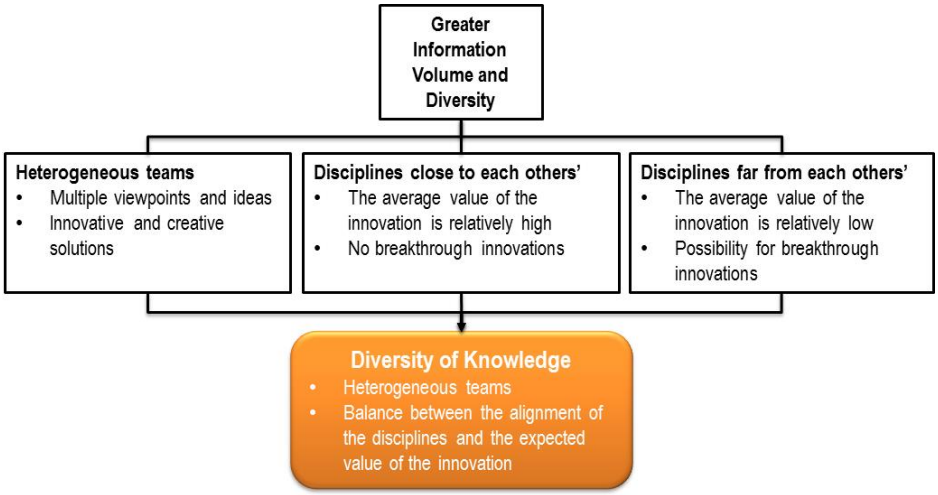

Figure 12. Greater information volume and diversity enabled by appropriate alignment of team members' disciplines

3.5.3. Creativity

"Creativity is seen as the cornerstone of innovation" (Klijn & Tomic, 2010, p. 322).

Creativity is widely studied in the academic world. According to some scholars (e.g. Adams, 2005; Klijn & Tomic, 2010), the knowledge about creativity theories, determinants and enhancers is still either somewhat lacking or inconsistent. Many questions, such as which factors influence organizational creativity or whether creativity is innate or can be acquired, are without unified answers. On the other hand, other scholars can provide advanced theories related to creativity

and even answer the above-mentioned questions (e.g. Woodman, Sawyer & Griffin, 1993; Amabile, 1997; Amabile, 1998). In this section the most relevant theories in terms of this research are presented and discussed.

According to Gaspersz (2007) ideas in an organization are vital as they can create profit, growth, survival, uniqueness and customer loyalty. He states that "ideas are the gold of any organization". Amabile , Conti, Coon, Lazenby & Herron, (1996) argue that all innovations begin with creative ideas and the successful implementation of new programs, new product introductions or new services depends on a person or a team having a good idea, and developing that idea beyond its initial state.

The idea that diversity fosters creativity has a long history (Strober, 2010). According to Klijn & Tomic (2010) there are two main definitions of creativity. First, creativity is defined as the production of new and useful ideas or solutions (e.g. Woodman et al. 1993; Amabile et al. 1996; Gaspersz, 2007). Creativity is also defined as the mental process that allows people to think up new and useful ideas (Gaspersz, 2007). The first definition refers to the actual idea or problem but also to the process of idea generation or problem solving. Mental process, on the other hand, occurs in five phases: problem or task presentation, preparation, response generation, response validation, and outcome. (Amabile, 1983). In the Handbook of Creativity (Mayer, 1999), the variety definitions of creativity are summarized, and the consensus that exists in the creativity research community states that creativity occurs when someone creates an original and useful product. Smith, Paradice, & Smith (2000) add that the originality (or novelty) or usefulness criterion can be satisfied at either a personal or societal level. However, as Amabile (1998) states, in the business, on the other hand, originality is not enough. An idea must also be appropriate, in other words useful and actionable.

Amabile (1998) and her research groups have studied creativity for decades and based on their findings a model that consists the three components of creativity has been created. This simplified schematic diagram is depicted in Figure 13.

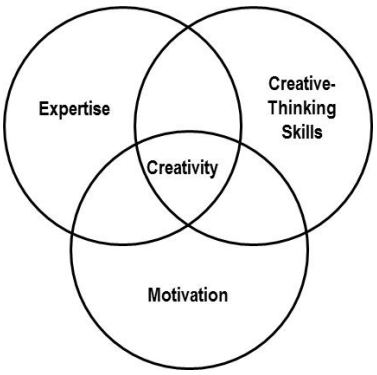

Figure 13. The three components of creativity (Amabile, 1998)

Expertise refers to everything that a person knows and can do. For instance, the expertise of a person can include the basic talent for scientific thinking, knowledge and technical abilities.

Naturally the larger this space, the better. *Creative thinking skills,* on the other hand, determine how a person approaches problems and solutions. The skills refer to the capacity to put existing ideas together in new combinations. It depends on the personality and how a person thinks and works. Both expertise and creative thinking skills are a person's natural resource and improving them is often expensive and time consuming. However, the third component, motivation, determines what a person will actually do and in principle, it is the easiest source to enhance creativity. Motivation can be divided into intrinsic and extrinsic. Extrinsic motivation comes from outside a person, and is for instance often money. Intrinsic motivation, on the other hand, refers to person's passion and interest to do something. This indicates that the work itself is motivating. For creativity, intrinsic motivation is much more essential. (Amabile, 1998).

According to Amabile (1998) managers can influence on all the three components of creativity but focusing on intrinsic motivation will result in more immediate gains. Based on more than two decades of research, Amabile suggests six categories that have emerged from her studies, how managers can enhance creativity: *challege, freedom, resources, work-group features, supervisory encouragement,* and *organizational support.* By conducting these managerial practices properly managers can affect creativity positively. There are again several similar elements which are already discussed in previous sections, for instance in the key characteristics of successful interdisciplinary research (see Table 2).

Measuring creativity, in terms of mental process, is difficult and can be only conducted by means of expensive laboratory experiments (Klijn & Tomic, 2010). Therefore creativity is measured often by questionnaires and assessments of the creative outcome (Smith et. al, 2000) which supports the earlier mentioned definition that creativity is the production of new and useful ideas or solutions. On the organizational level creativity can be interpreted as the creation of a valuable, useful new product, service, idea, procedure or process by individuals working together in a complex system (Woodman et al., 1993). Even though creativity is an individual trait, groups can also be creative. The creativity of its members can be perhaps capitalized on and enhanced. (Strober, 2010).

As it was discussed, one of the blocks in Bunduchi's (2009) model (see Figure 9) relates to higher creativity. In the same study she investigated best practices to support creativity in cross-functional teams. Four elements were discovered and they are represented in Figure 14.

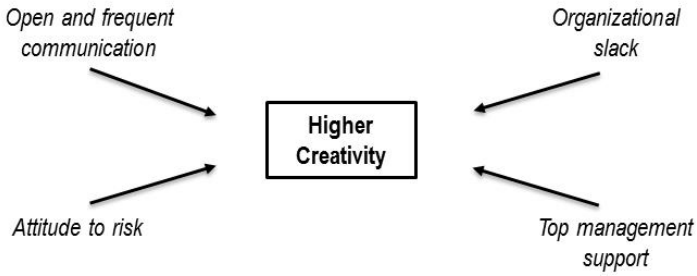

Figure 14. Stimulating elements of creativity in cross-functional team (adopted from Bunduchi, 2009)

According to Keller (2001) accurate, *open and frequent communication* among team members increases the diversity and volume of information shared, reduces misunderstanding but also builds job cohesion. Bunduchi (2009) adds that more accurate and diverse information improves the quality of decision making and increases a team's absorptive capacity of information understanding. Hence, there is a strong positive relationship between cross-functional communication and NPD performance (Song, Montoya-Weiss & Schmidt, 1997). *Attitude to risk* refers to the team's willingnes to take risks to pursue untried ideas. Risk taking is one of the key variables that positively affect product innovativeness. (Sethi, Smith, & Park, 2001). In an organization where risk taking is part of the culture, people learn how to avoid errors and mistakes in the future as well as being encouraged to make fast decisions, which speeds the NPD process. Hence, encouraging risk taking in CFTs supports creativity, especially during the idea generation phase, leading to shorter development time and higher product innovativeness. (Bunduchi, 2009). *Organizational slack* describes the difference between the resources currently needed and the total resources available in an organization. Providing the appropriate level of organizational slack is associated with more creative organizations and with higher performance in NPD. This results from that by providing people with own idea time to generate innovative ideas and by supporting the development of these ideas, people will naturally be more creative. (Bunduchi, 2009). A last very important stimulating element of creativity is *top-management support*. Again, this is the same element that has already been discussed in other contexts earlier in this study. Song et al. (1997) propose that management plays a dual role in a NPD process: top management should actively fight for the project, support it and provide strategic direction, but also create policies and procedures (for instance reward and evaluation systems) that foster an internal culture of cross-functional cooperation. Lack of strong top management support means more time is required to negotiate, for instance access to resources, which delays the process (Bunduchi, 2009).

Hence, it can be concluded that creativity and creative ideas are beneficial to an organization. From the findings of this section the next building block for the theoretical framework is created (Figure 15). The most important literature findings are again summarized and the theoretical approach of how to enhance creativity in an organization is created. The figure shortly explains what creativity actually means and how it interfaces with innovations, what the three components of creativity are and which one of the components should be focused on to enhances creativity, and what are the stimulating elements of creativity in general. Instead of higher creativity, the building block is named productive creativity.

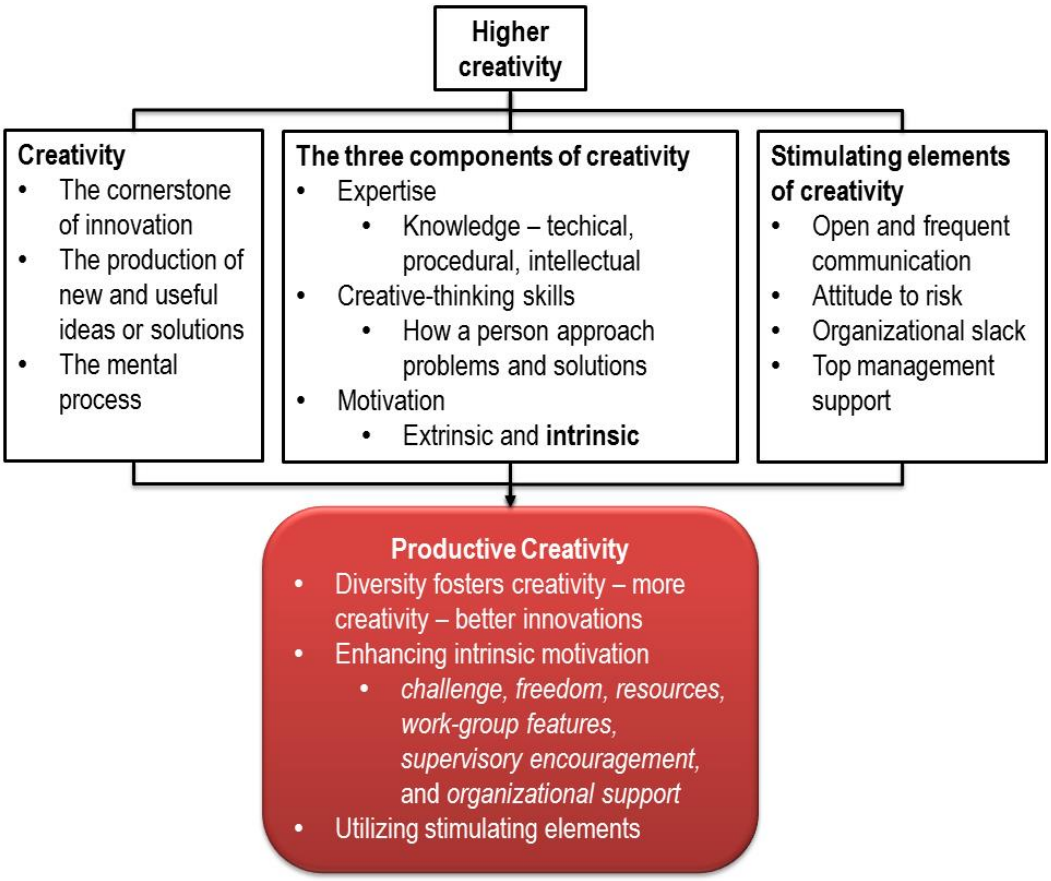

Figure 15. The sources of higher creativity (better innovations)

3.5.4. The Relation of Creativity and Innovation

"Innovation is the process of implementing ideas with a new value. That is why creativity and innovation are inseparable partners. Without creativity innovation cannot be fed. Without innovation we will be left with lots of valuable but unimplemented ideas." (Gaspersz, 2007).

The innovations and the innovation theories are extensively studied in literature. Hence, in this section the theory of innovation is limited and only the basic and the most relevant themes in terms of this research are introduced.

Innovation is defined as a successful application of new ideas in practice in the form of new or improved products, services or processes by Bruce & Bressant (2002). Koria & Salimäki (2013) adds that any definition of innovation involves three main attributes: *novelty, utility and success*, and without these there is no innovation. *Novelty* in this connection means that the innovation has to be something new as in previously unknown or as novelty to the circumstance. *Need*, on the other hand, indicates that innovation is based on need, co-evolution and flexible organizations and management with insight. The last attribute, *success*, means that if there is no success there is no innovation. Success in this case can be commercial success, success in organizational configuration or reconfiguration of assets. Diffusion is the measure of success.

Von Stamm & Trifilova (2009) describes that the future of innovation is based on collaboration, convergence and interdisciplinary research. They add that the current problems to solve are just

too extensive for an individual. Open-source software is used as an example. Regardless of whether individuals can solve the current problems or not, as it was discussed in the previous sections, teams and cross-functional collaboration can facilitate the problem solving. This indicates that by following this theory more successful innovations can be created.

As described in Bunduchi's (2009) model, by following the process depicted in Figure 9, better and more innovative products can be created and delivered quicker to the markets. For instance the information diversity created by a cross-functional team aids the decision-making and helps the team to identify and correct mistakes early in the process leading to better product quality and saving time. (Song et al. 1997; Keller, 2001). Amabile (1997) has investigated the final step of Bunduchi's (2009) model, the relation between creativity and innovation or more broadly, the organizational working environment which creates innovations. The three organizational components are *resources, management practices* and *organizational motivation*. The three components of creativity were expertise, creative-thinking skills and motivation, and they are depicted in Figure 13. In Figure 16 the impact of the organizational environment on creativity is depicted.

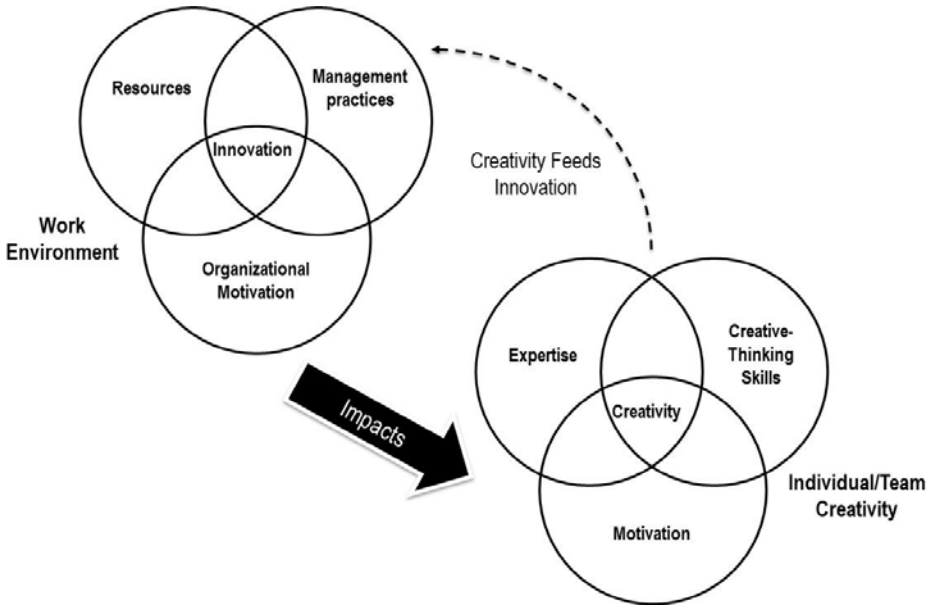

Figure 16. Impact of the organizational environment on creativity (adopted from Amabile, 1997)

The core idea of the model is that elements of the work environment will impact on a person's or team's creativity. This is depicted by the solid arrow. However, the model also proposes that the creativity is a primary source of innovations within the organization. This is depicted by the dotted arrow. According to the Amabile's (1997) theory the social (work) environment influences creativity by influencing the individual components. Although the environment can have an impact on any of the components, the impact on motivation (especially an intrinsic motivation) appears to be the most effective and direct. (see Section 3.5.3).

In Figure 17 the last building blocks of the theoretical framework are represented. In Burdunchi's (2009) model the final outcome of the process was to have better and more innovative products

at to the markets faster, in other words to create competitive advantage. According to the findings of this section, the important enablers are the complete process, including CFT and greater information volume and diversity (discussed earlier), and the understanding of the relation of the appropriate work environment and creativity. In Figure 17 the Burdunchi's (2009) model is further developed by adding the most relevant findings.

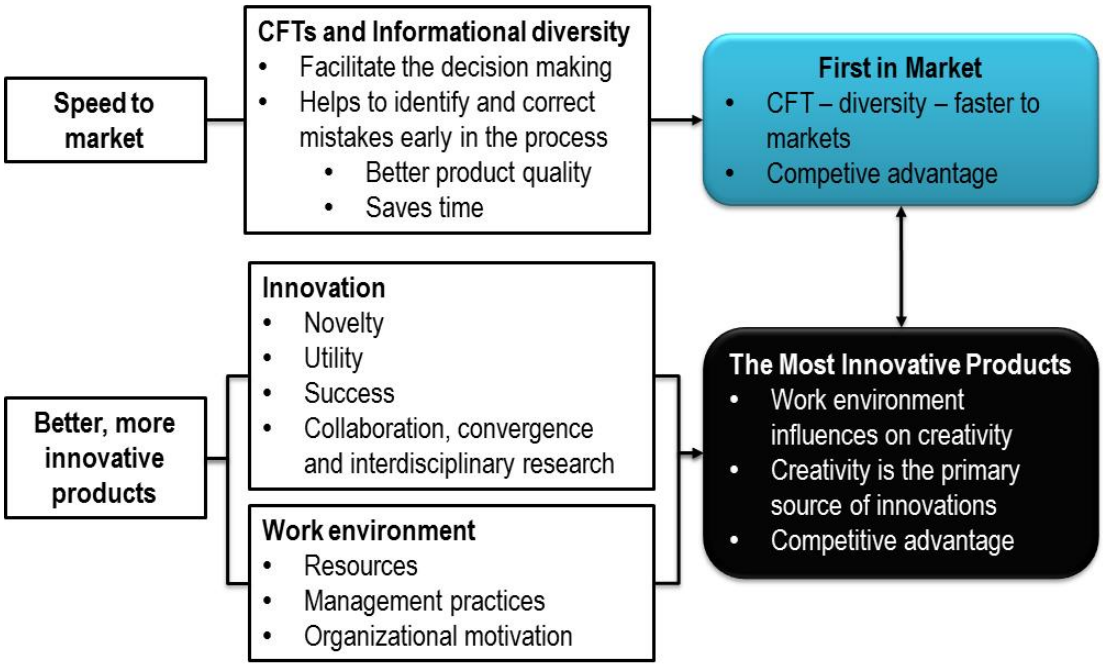

Figure 17. The theory to create innovative products quickly to the markets

3.6. Challenges and Threats of Interdisciplinarity

In Section 3.5 the advantages of interdisciplinarity were widely discussed. This section summarizes some of the typical challenges and threats of interdisciplinarity, providing general arguments but not a deep analysis of the disadvantages of interdisciplinarity.

Stember (1991) provides a practical argument for interdisciplinarity by saying that problems of the world are not organized according to academic disciplines. However, paradoxically this relates also to the reason why many academics want to avoid interdisciplinary research – it is difficult enough to acquire expertise in one discipline, hence going outside your own expertise field should be avoided (Thagard, 2010). He also states that the time required to become an expert outside your own main area or to learn novel methods from another field can be huge and often difficult to find. Engaging in interdisciplinary projects has large up-front costs because it takes time to understand one another's work well enough to begin collaborative initiatives (Strober, 2010). In addition, hiring and reward systems, such as promotion, salary and grants generally, favor often those who focus narrowly on one discipline. (Strober, 2010; Thagard, 2010). Furthermore the narrow-minded colleagues may not appreciate interdisciplinary research that much (Thagard, 2010).

When it comes to interdisciplinary or cross-functional projects, sometimes projects can look as if they were designed more to bring in big research grants than to accomplish intellectual goals (Thagard, 2010). Strober (2010) adds that the evaluation, if the project is successful or not, can be also difficult. It is often executed by people or colleagues from different disciplines, each likely to use different criteria for originality or effectiveness. She even believes that in an academic world it may be difficult to find a journal that is willing to publish work that crosses disciplinary lines.

As it was discussed in Section 3.5.2, in many organizations cross-functional and heterogeneous teams are favored because they can provide multiple viewpoints and ideas, leading to innovative and creative solutions. However, as it was discussed in the section, the challenge is to have an optimal alignment of the team members' disciplines or functions. Having team members from functions that are very far from each other's may result to a breakthrough innovation but the average result is not as valuable as from a conventional team. The threat is for a manager to be too "greedy" in the hope of constantly creating breakthrough innovations, and that can be very expensive to the company.

3.7. Theoretical Framework

In Figure 18 (next page) the complete theoretical framework of the thesis is presented. The framework consists from the building blocks that are constructed during the chapter and it is the basis for the empirical part. In this form, the theoretical framework is somewhat heavy and extensive. Hence, a simplified version of the model is also constructed. This is depicted in Figure 19. The simplified schematic diagram depicts and summarizes the most important findings from literature. This model provides a suggestion of a blueprint of how to gain advantages from interdisciplinarity.

3.7.1. Approach to the Empirical Part

As it was mentioned, the theoretical framework creates the basis for the empirical part. The empirical part is introduced in the following chapters. However, to understand the connection between the theoretical framework and the empirical methods, it is reminded already at this stage that the empirical part consists of questionnaire and personal interviews. The questionnaire is based on two reference surveys and the results of the questionnaire are compared to the reference studies. Therefore also the approach to connecting the theory and the empirical part can be divided in two parts. The conducted questionnaire generally aims to find out whether the theory applies to reality or not. The purpose of the interviews, on the other hand, is to gain a better understanding of what is behind the theory, and especially how it comes true in practice. Both of the methods are discussed more profoundly in the following chapter.

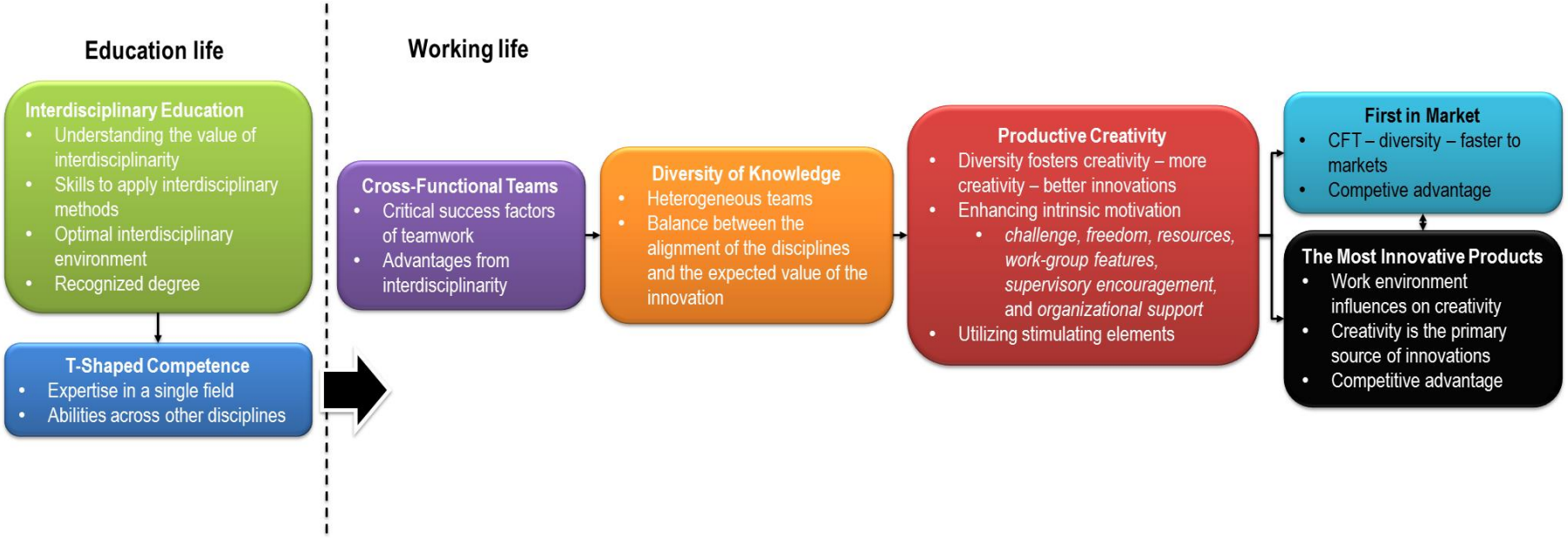

Figure 18. The complete theoretical framework of the thesis

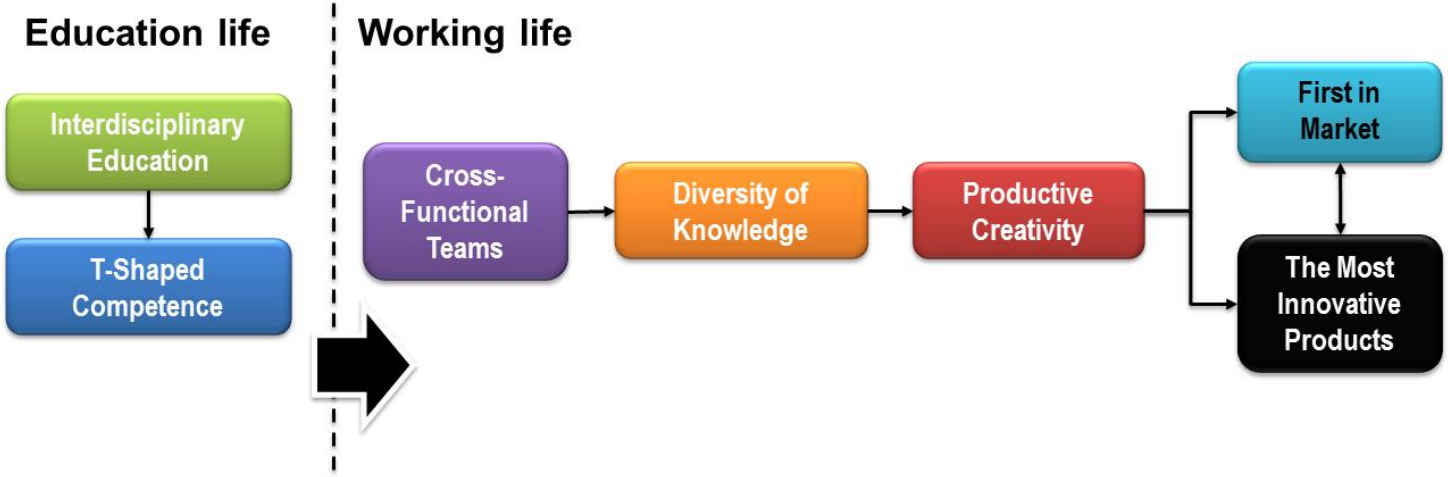

Figure 19. The simplified theoretical framework of the thesis

4. RESEARCH METHODOLOGY

The terms *methodology* and *methods* are often used to describe how the research is actually constructed and conducted. The terms are sometimes confounded with each other and some writers even use the terms interchangeably, even though there are fundamental differences in the meanings. According to Collis & Hussey (2003) methodology refers to the overall approach to the research process, from the theoretical construction to the collection and analysis of the data. Methods, on the other hand, refer to the various means of how the data is collected and/or analyzed.

This chapter introduces the overall methodology of the thesis but also the methods that are used. First, the *research paradigm* is discussed which is followed by a section that explains why the *theory-bounded* approach is applied. After that the selected methodological course (*explorative research* and *case study*) is elaborated. In the case study section the focus is on the general knowledge of this kind of research method. The case itself was introduced in more detail earlier (Chapter 2). After the case study section the most important applied methods are introduced. In the *data collection* section it is described how the data was actually collected. The target and the control groups of the research are introduced, and the sizes of the sample and the structure of the questionnaire are explained. After that it is discussed why both *quantitative* and *qualitative* analyzing research methods are used and what are the benefits of the mixed methods. It is also described how the findings and conclusions are derived from the questionnaire and interviews. In the *quality criteria* section the generalization of the results is discussed and the *validity* and *reliability* of the research is evaluated.

4.1. Research Paradigm

In the beginning of the research process it should be decided what the position of the theory in the research entirety is (Saaranen-Kauppinen & Puusniekka 2006). Research paradigm aims to answer this question, hence in this context it refers to of how the research should be conducted. Paradigms offer a framework consisting of an accepted set of theories, methods and ways of defining data. *Positivistic paradigm* and *phenomenological paradigm* are the two terms often used to describe the main research paradigms. These are not the only used terms but several others can be found in the literature, such as *objectivist* and *subjectivist, scientific* and *humanistic* or *experimentalist* or *interpretivist.* However, probably the two most common terms to describe the main research paradigms are *quantitative* and *qualitative*. (Collis & Hussey, 2003). Hence, also in this thesis the terms quantitative and qualitative paradigms are used.

4.1.1. The Scientific Positioning of the Research

The paradigms described above are the two extremes of a continuum, and as it is moved along the continuum the features and assumptions of one paradigm are gradually changed and replaced by those of the other paradigm (Collis & Hussey, 2003). Positioning the research in terms of philosophy of science means that the research is positioned somewhere between the two main

paradigms, or as very often to the one extreme of the continuum. The position depends on what kind of phenomenon the research is based on. Qualitative research is suitable when a unique phenomenon or occasion is investigated, whereas quantitative research is more convenient for examination of social phenomenon (Alasuutari, 1999). The quantitative research aims to generalize results based on large sample of data that consists normally of numbers. The conclusions are made from the results by following statistical reliability (Steckler, McLerory, Goodman, Bud & McCormach, 1992). In qualitative research the data can be verbal or visual, including for instance interviews, observations, images or voice material (Eskola & Suoranta, 1998).

This thesis cannot be positioned at one of the two extremes of research paradigms, but it can be positioned at some level at both of the main paradigms. However, because methods from both of the extremes are applied, this thesis is positioned between the two extremes – it is a mixed research. The mixed research is a general type of research in which quantitative and qualitative methods, techniques, or other paradigm characteristics are mixed in one overall study (Johnson & Christensen, 2010). Table 3 summarizes the three paradigms (quantitative, qualitative and mixed) and the main differences between them. By examining the table it can be noticed that the mixed research paradigm the most appropriate for this thesis due to, for instance, this research is both *deductive* and *inductive*, behavior of the target group is somewhat predictable, the phenomenon is examined with *multilens focus*, the data is collected in *multiple forms*, the corroborated findings can be generalized, and the form of the final report is *eclectic* and *pragmatic*.

Table 3. Emphases of quantitative, mixed, and qualitative research (Johnson & Christensen, 2010).

	Quantitative Research	Mixed Research	Qualitative Research
Scientific method	Deductive or "top-down" The researcher tests hypotheses and theory with data	Deductive and inductive	Inductive or "bottom-up" The researcher generates new hypotheses and grounded theory from data collected during
View of human behavior	Behavior is regular and predictable	Behavior is somewhat predictable	Behavior is fluid, dynamic, situational, social, contextual, and personal
Most common research	Description, explanation, and prediction	Multiple objectives	Description, exploration, and discovery
Focus	Narrow-angle lens, testing specific hypotheses	Multilens focus	Wide-angle and "deep-angle" lens, examining the breadth and depth of phenomena to learn more about
Nature of observation	Attempt to study behavior under controlled conditions	Study behavior in more than one context or condition	Study behavior in natural environments. Study the context in which behavior occurs
Nature of reality	Objective (different observers agree on what is observed)	Commonsense realism and pragmatic view of world (i.e., what works is what is "real" or true)	Subjective, personal, and socially constructed
Form of data collected	Collect quantitative data based on precise measurement using structured and validated data collection instruments (e.g., closed-ended items, rating scales, behavioral responses)	Multiple forms	Collect qualitative data (e.g., in-depth interviews, participant observation, field notes, and open-ended questions). The researcher is the primary data collection
Nature of data	Variables	Mixture of variables, words, and images	Words, images, categories
Data analysis	Identify statistical relationships	Quantitative and qualitative	Search for patterns, themes, and holistic features
Results	Generalizable findings	Corroborated findings may generalize	Particular findings. Representation of insider (i.e., "emic") viewpoint. Present multiple perspectives
Form of final report	Statistical report (e.g., with correlations, comparisons of means, and reporting of statistical significance of findings)	Eclectic and pragmatic	Narrative report with contextual description and direct quotations from research participants

The research paradigm and the scientific positioning of the thesis have now been defined. It can be still further discussed of how to approach the research in terms of data and theory. In the following section the three main approaches are introduced and it is explained why the theory-bounded approach is selected.

4.1.2. Theory-Bounded Approach

According to Eskola (2001) there are three main options to approach the research: theory-driven, theory-bounded or data-driven approach. The most important elements of the three options are depicted in Figure 20.

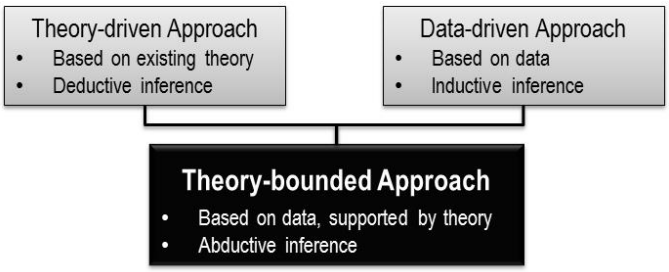

Figure 20. The three research approaches (Eskola, 2001)

In the theory-driven approach the analysis is based on an existent theory or model and often the objective is to test the theory or the model in a new environment. The theory-driven approach is frequently applied in natural science researches and it is also called deductive inference. (Tuomi & Sarajärvi 2002). In the data-driven approach the focus is on the data or material and the theory is constructed based on the findings. This approach is also called inductive inference which means that the research process proceed from individual observations to more common assertions. (Eskola & Suoranta 1998). Hirsjärvi et al. (2004) also state that in the inductive approach the objective is not to test the theory or hypothesis which means that the researcher should not decide what is important and what is not. The objective is more to follow the observations and complete a theory around it. However, pure inductive reasoning is not possible because it bases on a simple description of the findings without a preconception of the studied phenomenon.

In the middle of the theory-driven and data-driven is the theory-bounded approach, which is also called abductive inference. The analysis of the data and material in this approach is not based directly on theory; however the connections can be easily discovered. In this case the conclusions from the research findings are supported by the explanations and confirmations of theory. It can also be concluded that the empirical findings are not necessarily equivalent to previous research findings. (Eskola 2001).

Despite the literature review chapter providing a construct model from existent theory, the theory-bounded approach is applied in this master's thesis. The model and the theory, related to the research objectives, were in some extent examined, and an initial theoretical framework was constructed before the empirical research. However, the research process itself was directed by the findings from the empirical explorations. This means that the process became iterative as the theory was examined more profoundly when more empirical data was received. Thus, the theoretical framework was somewhat refined during the empirical explorations.

4.1.3. The Research Process

The research process chart describes the methodology and the methods used in the research in chronological order. In Figure 21 the research process is depicted graphically. In the following sections all the blocks of the research process chart (Figure 21) are introduced.

Figure 21. The research process

4.2. Exploratory Research

According to Ghauri & Grønhaug (2005), "research design is the overall plan for connecting the conceptual research problems to the pertinent (and achievable) empirical research." This means that research design provides a plan for data collection and its analysis. An important factor in research design is that it should be effective in producing the wanted information within the constraints, such as time, budget or skills. Research design in business studies are commonly divided into three: *exploratory, descriptive and causal research* (Ghauri & Grønhaug, 2005; Zikmund, Babin, Carr & Griffin, 2012; Brown & Suter, 2012).

In descriptive research the problem is usually structured and well understood (Ghauri & Grønhaug, 2005). The major emphasis is on determining the frequency with which something occurs. It is usually concerned with describing a population with respect to important variables. Causal research, on the other hand, is used when cause-and-effect relationships between variables are investigated. (Brown & Suter, 2012). Also in causal research the problems that are investigated are structured well. However, in contrast to descriptive research, it is possible to confront cause-and-effect problems as well. The main task is to isolate causes and examine whether and to what extent causes result effects. (Ghauri & Grønhaug, 2005).

That being said, the design which is applied in this research is exploratory. According to Brown & Suter (2012) the main purpose of an exploratory research is to provide a better understanding of a situation. According to Ghauri & Grønhaug (2005) if the understanding of the research problem is limited, an exploratory research design is adequate. However, as Brown & Suter (2012) continue, exploratory research is not necessarily designed to expose universal truth. More like researchers aim to produce hypotheses about what is happening in the situation. According to Churchill & Iacobucci (2010), the initial tools for exploratory research include literature searches, experience surveys, and the analysis of selected cases. They remind the methods provided by Brown & Suter (2012) which are introduced in Figure 22.

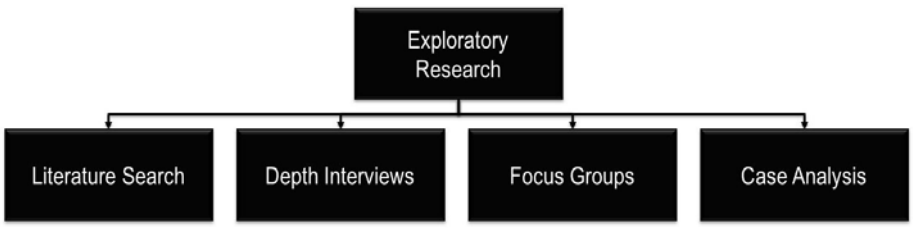

Figure 22. The common methods of exploratory research (Brown & Sutter, 2012)

Literature search indicates a search of literature such as academic literature, published statistics from research firms or governmental agencies for data or insight into the problem that is examined. Literature search is often the best way to start the research because it is also one of the quickest and least costly ways. The purpose of *depth interviews* is to gain as much information as possible from people with knowledge and experience about the general subject being investigated. Hence, anybody with relevant information is a potential candidate for an in-depth interview. *Focus groups* interviews are probably one of the most common techniques used in market research. The idea is to have an interview conducted among a small number of individuals simultaneously. Typically the interview relies more on group discussion than on directed questions. The last type of the common types of exploratory research is *case analysis.* Case analysis is an intensive study of selected examples of the phenomenon of interest. (Brown & Suter, 2012). It is discussed more in the following section.

As it was mentioned earlier, the core research design applied in this thesis is the exploratory research. This can be seen also when reviewing the methods used in the research. Three out of four of the research tools introduced in Figure 22 are utilized. An extensive literature search is conducted to gain better understanding of the issue but also depth interviews and case analysis are executed.

4.3. Case Study

In most qualitative research some sort of case study method is used. In a case study the main purpose is to investigate a present one-off phenomenon in its own environment. (Sulkunen & Kekäläinen, 1992). The case studies are well suited for business research because complex and "hard-to-grasp" business issues, such as organizational or managerial issues, can be presented in a vivid and accessible format in case studies. It is no wonder why case studies have become one of the most popular inquires in the field of qualitative research (Stake, 2000).

In a case study an occurrence, an exclusive entirety or an individual is examined by utilizing multiple information sources, material and data. In case studies the phenomenon are explained by asking how- and why-questions. (Yin, 1994). Individual cases are observed in the natural environment and the methods are not necessarily aiming to explain the connections between the phenomenon, testing hypotheses or predicting, but the objective is to describe the research subject systematically, precisely and truthfully. (Hirsjärvi et al. 2004). It is important in case studies that the investigated phenomenon composes some sort of entirety. It is possible to use several tools to execute a case study, in other words, the method does not limit the selected tools. Hence, for instance both quantitative and qualitative methods can be used. (Yin, 1994).

In case studies the objective is usually to enhance the understanding of the problem investigated, and not necessarily to create universal knowledge about the subject. Case studies are commonly used when a deeper understanding of the phenomenon and a better perception of the context (environment, background etc.) are wanted. However, even though the purpose is not to create

universal knowledge, in a sophisticated case study the findings are also evaluated on a large scale. (Saaranen-Kauppinen & Puusniekka, 2006).

Although a case study typically focuses on single case, the process of building a theory from case study research should be iterative. The researcher may focus on one part of the process at a time, but the process itself involves iteration. This may include for instance moving from cross-case comparison back to redefinition of the research questions. (Eisenhardt, 1989). In this research the process has been iterative, and for instance the research questions are refined during the process. In his article Eisenhardt (1989) has collected steps, activities and reasons of the process of building theory from case study research into one table. The table has offered guidelines for this thesis as well. The steps of the table are represented in Figure 23.

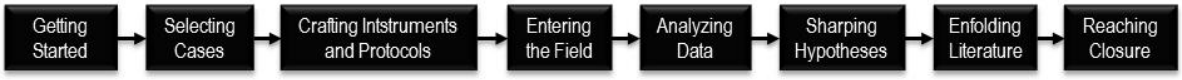

Figure 23. Process steps or building theory from case study research (adopted from Eisenhardt, 1989)

According to Flyvbjerg (2006) it is a common misunderstanding about case study research that "one cannot generalize from a single case, therefore, the single case study cannot contribute to scientific development". His studies correct this misunderstanding and substantiate that social science can be strengthened by the execution of good case studies. One strength of theory building from a case study is the likelihood of generating a novel theory. (Eisenhardt, 1989). But, as Eisenhartdt & Graebner (2007) state, the generalization of the theory encounters many legitimate challenges. However, according to the authors, fortunately most of these challenges can be mitigated through precise language and thoughtful research design. They also emphasize the importance of careful justification of theory building, theoretical sampling of cases, interviews that limit informational bias, rich presentation of evidence in tables and appendices, and clear statement of theoretical arguments. To gain as good results as possible to generalize the findings, the recommendations mentioned have also sought to apply in this thesis.

4.4. Data Collection

In the study two types of information collection methods were used: a questionnaire and deep interviews. In this section both of the methods are introduced and the details are explained. At the end of the section the sample sizes are discussed and the response rates are reviewed.

4.4.1. The Questionnaire

The questionnaire data was collected by using Webropol online survey and analysis software. Internet surveys have several pros and cons. The filling of the survey is often relatively easy and affordable (Kyttä, 2001) and results are directly transferable to the statistics program (Heikkilä, 2004). The collecting of the data was conducted once, thus the survey can be considered one-time cross-sectional survey. Another option is to conduct a longitudinal survey, which means that the data is collected repeatedly.

In order to utilize online survey methods, the respondents have to have access to the Internet and they have to know how to use the Internet (Heikkilä, 2004). Both of these requirements were fulfilled due to the high education background of the respondents. Challenges in online surveys also cause the uncertainty in the representation of the respondents. For instance the prerequisites of a reliable online survey are not fulfilled if anyone who finds the survey on the Internet can answer to it (Heikkilä, 2004). In this research, this threat was minimized by editing the online survey settings in such a way that every respondent received an individual e-mail, which contained a personal link to the survey. Hence, in any other way the survey would have been very difficult to find on the Internet.

It is also very typical that the amount of answers in online surveys remain rather limited (Kyttä, 2001). In addition, possible exaggeration or even direct mendacity may affect the reliability of the results. The concentration of the respondents can be lower compared to the interviews while there is no social pressure present caused by the interviewer. However, an anonymous online survey can also release the respondent from pressure. The online survey answers might also be fluctuating and the risk of misunderstanding the questions is high. (Heikkilä, 2004). In this research the respondents were past IDBM students. Based on conversations with IDBM faculty and on the experience of the author, the IDBM students have typically been very motivated and interested when it comes the issues and questions related to the program. Therefore it can be assumed that the online survey answers were relatively reliable and imply the true opinions of the respondents.

4.4.2. The Structure of the Questionnaire

The layout of the questionnaire is represented in Appendices. The structure can be divided into three parts: basic information, working career and the contribution of the IDBM program. In the first part general information is asked, such as the gender, the educational background and the graduation year. The second part relates to the job situation during the studies, right after graduation and five years after graduation. There are questions such as how the respondent got their first job, what was the position of the respondent in the first job or in the job five years after graduation, and what are the main tasks/duties in the job. The last part aims to discover what kind of contribution the IDBM program has had to the respondents' career, for instance what kind of skills and knowledge the school and the program provided, have the respondents utilized the knowledge and did that have a positive influence. As this research focuses on the minor IDBM Program, in this part of the questionnaire the term multidisciplinary is used instead of interdisciplinary.

Most of the questions were in multiple choice formats to facilitate and expedite answering. The questions were mostly constructed using the two control research questionnaires (see Chapter 2.3) as example bases. The wording and phrasing were similar to in the two control researches. This was done to have as high of comparability between the researches as possible. However, additional questions were also included to gain a deeper understanding of the research problems.

4.4.3. Piloting the Questionnaire

Before the final version, the questionnaire was tested three times. The first version of the questionnaire was created by the author, together with the two supervisors. The first pilot version also included feedback questions about the questionnaire itself. Members of the IDBM faculty, as well as IDBM alumni from the School of Science filled the survey and provided important feedback. After the first pilot version the questionnaire was refined and tested again.

The first pilot version of the questionnaire was complete in October 2013, the second version in November 2013 and the final version was sent to the target group in December 2013.

4.4.4. Conducting the Questionnaire

The personal information of the students that participated in the IDBM minor program between 1995 and 2010 was received from the program's database. The information included the names of the alumni, e-mail addresses and most of the telephone (mobile) numbers. However, a large amount of the information had become outdated. Especially a large number of female students had changed their surnames, which complicated contacting them. Therefore, tracking down the respondents required lots of other tools and some imagination. Different kinds of web pages became crucial to track down the right person. For instance, the phone numbers were confirmed from the contact information service Fonecta, a business oriented social networking service LinkedIn was utilized a lot, but also Facebook and homepages of the firms were used. In addition, a name list of the untracked persons was sent to SEFE, which helped to discover the missing contact information.

Before sending the survey, every alumnus was contacted first by phone. This was conducted to confirm the correct e-mail addresses, but also to shortly explain what the survey is about. This method turned out to be very useful as numerous respondents mentioned that in the free word section of the questionnaire. They mentioned that by only sending an e-mail they would probably have not responded, but due to the personal contact first the motivation for responding was higher.

After the phone contact the link to the questionnaire was sent directly to each respondent's e-mail. After one week from the first e-mail a reminder message was sent if the receiver had not answered to the questionnaire. The covering letter and the reminder message can be found in Appendices. Both of them were constructed by following the instructions of KvantiMOTV (2012).

4.4.5. The Size of the Questionnaire Sample

From 1995 to 2010 a total of 182 business students participated to the multidisciplinary IDBM minor program. These alumni were the target group of the survey and the target sample of the research. 150 alumni were reached by phone and 20 alumni's e-mails were confirmed other way. The contact information of 12 people could not been found. Thus, totally 170 e-mail was sent to

the confirmed e-mail addresses. In total 103 questionnaire answers were received, which is 56,6 % percent of the total target group and 60,6 % of the confirmed contacts.

There are various opinions about reliable sample size. According to Heikkilä (2004) the minimum size of the sample in quantitative research should be between 200 and 300, whereas Vilpas (2014) states that the regular recommendation for a quantitative research is minimum 30 respondents. However, he continues that the size of the sample depends remarkably on the type of the research. According to him there are three crucial factors affecting the size of the sample:

1. The heterogeneity of the population – the greater variety, the bigger the size should be
2. The expected loss – the response rate is rarely 100%
3. The relative proportion of the investigated cases

Vilpas (2014) also provides indicative sample sizes depending on the research:

- usually a minimum of 50 respondents
- a minimum of 100 respondents, if the target group is narrow and the results are observed from the overall level
- 150-300, if control groups exist where the research is focused on (minimum 30 persons in each group)
- a minimum of 500-1000 in national consumer studies
- if the sample size is more than half of the population, an overall research is recommended

In this research, the maximum sample size was 182 and the amount of answers 103 which is over half of the population. Due to the relative high percentage of the answers, the amount of answers can be considered reliable enough. On the other hand because IDBM program is only another interdisciplinary program among all the other similar types of programs, the target group can be considered to be just a sample within a larger entity. However, from this perspective, the amount of answers is also high enough because the target group is narrow and the results are observed from the overall level.

4.4.6. The Control Group

As it was discussed earlier (see Section 2.3) the questionnaire of the thesis was constructed by using two separate reference questionnaires: SEFE's annual questionnaire for recent graduates and the Career and Employment Survey conducted by Finnish Social Science Data Archive (FSD). From now on the terms SEFE and FSD are used describing those two studies. The results from the two reference studies were used as a control group to compare the data. To gain as reliable a comparison as possible the sample of the control group was from the same period or almost from the same period as the sample of the target group.

The data from the SEFE's annual questionnaire for recent graduates was collected from the surveys in years 1999 to 2012 because most of the IDBM alumni (93 %) graduated also between these years. Between 2002 and 2005 the questionnaire was conducted every second year, in such a way that the 2003 report included also the data from 2002 and the 2005 report included also

the data from 2004. Hence, totally the results of the control group were from 12 separate SEFE's studies and from a span of 14 years. The content of the questionnaire has changed slightly over the years, and therefore not all the comparison data is from all of the 14 years. In these cases the comparison period is always mentioned separately.

The objective of the FSD survey is to explore the working careers and employment of the business school alumni. The survey is conducted to the business school graduates five years after graduation and it is conducted usually every second year. The comparison surveys that are used for this thesis are from years 2007, 2009, 2011 and 2013, and thus the respondents of these surveys have been graduated in years 2001, 2002-2003, 2005 and 2007. Hence, also the data of this control group is from the alumni graduated in almost the same period as the IDBM alumni.

4.4.7. In-depth Interviews

In addition to the questionnaire, four in-depth interviews were conducted to gain a deeper understanding for the research questions. The four respondents were selected from the results of the questionnaire according to two requirements. The first requirement was that the respondent was willing to participate for further studies and had written his or her e-mail address in the questionnaire. The second requirement was related to the year the respondent did the IDBM program and the gender. To gain as comprehensive responses as possible from the whole period (1995 – 2010), the respondents were selected from various IDBM classes as well as from both genders. The details of the respondents can be found in the Appendices.

According to Eskola & Suoranta (1998) research interviews can be divided into four groups depending how fixed the questions are and how remarkable a role the interviewer takes. In a *structured interview* the form and the order of the questions are identical for every interviewee, and the response options are given in advance. In the *semi-structured interview* the questions are identical for everybody but there are no fixed response options and the interviewee can answer by using their own words. The third group is *a theme interview* in where the subjects are predetermined but without any fixed questions. In the last group, in *an open interview*, the idea is to have open discussion between interviewer and interviewee about the subject. In this method the subjects can vary and the contents of the interviews may differ among distinct interviewees.

In this thesis the interviews were conducted by using the semi-structured method. The supporting questions were decided in advance and they were similar among every interviewee (see Appendices). However, no constraints were set to the answers, and hence the conversation between the interviewer and the respondent developed around the themes, which produced rich and versatile data.

4.5. Data Analysis

As it was discussed in the beginning of this chapter the scientific positioning of this research is between the two main paradigms: quantitative and qualitative paradigms. Hence, both of the methods are used in the analysis of the results. In this section the main methods are introduced.

4.5.1. Quantitative Analysis

Scientific method in this research is somewhat deductive as the constructed theory is tested with the data. The research objectives also aim to more or less describe, explain and explore. Both of the reference questionnaires, as well as the thesis' questionnaire, include several multiple choice questions. Hence, a great amount of data is variables taking different values or categories. The variables can be statistically analyzed, and thus the findings can be generalized to some extent. The most important data from the questionnaire is represented in Appendices.

The main purpose of using quantitative methods in this thesis is to gain as many and as reliable answers to *what*-questions. This is a typical approach in quantitative analysis (Wright, 2004). In other words, the quantitative analyzing methods aim to test whether the findings in the theoretical framework happen in reality or not, and if the questionnaire data reveals remarkable differences comparing to the reference studies. The quantitative analysis creates the basis for the research. However, the intent is not to use the most sophisticated and rigorous mathematical calculations, but the most important applied quantitative methods are (arithmetic) mean, median, mode, percentages and margin of errors. They are calculated by using following formulas and definitions (KvantiMOTV, 2012):

(1) **Mean**: $\boxed{\bar{x} = \frac{x_1 + x_2 + \ldots + x_n}{n}}$, where $x_1 + x_2 + \ldots + x_n$ is the sum of the sampled values and n is the number of items in the sample

(2) **Median**: is the numerical value separating the higher half of a data sample from the lower half. If there are even numbers of variable values, the median is the mean of the two values in the middle.

(3) **Mode**: is the value that appears most often in the sample

(4) **Percentage**: is a number or ratio expressed as a fraction of 100

(5) **Margin of error**: $\boxed{E = \text{Critical value} * \frac{s}{\sqrt{n}}}$, where the critical value comes from 95 % confidence interval, s is the standard deviation of the sample and n is the number of items in the sample.

In the comparison between the IDBM alumni and all the business student alumni it is not investigated if the findings are statistically valid because the original data of the reference studies (see Section 4.6.1) were not available.

4.5.2. Qualitative Analysis

In general qualitative research enables a deep analysis of the opinions and experiences that the people, who participate in the research, provide. Hence, the qualitative research method is very suitable when studying complex phenomenon. (Ritchie & Lewis, 2003). By reviewing Table 3 it can be seen that there exist elements in the research that support qualitative analysis. As it was mentioned, the thesis is somewhat deductive but at same time also inductive. The theory of the work is refined during the fieldwork in an iterative way. The focus of the qualitative part of the research is to examine the breadth and depth of phenomena to learn more about them. The deep interviews provide subjective and personal opinions and the nature of the data is mainly words. In the results direct quotations from research participants are used.

Because interdisciplinarity itself can be seen to be very complex, and because one of the purposes of this research is to gain a deeper understanding of the alumni's opinions, the qualitative method is a natural choice as one of the research methods. As the quantitative part aimed to answer the what-questions, the objective of the qualitative part is to answer *why*- and *how*-questions related to research objectives. In other words, one goal of the qualitative analysis is to gain a deeper understanding about the theoretical framework and about the questionnaire answers.

4.5.3. Integrating the Quantitative and Qualitative Methods

Steckler et al. 1992 have discussed the integration of the quantitative and qualitative methods. Both the methods have weaknesses but to a certain extent they can be compensated for by the strengths of the other. There are at least four ways to integrate qualitative and quantitative research methods. The different approaches are depicted in Figure 24.

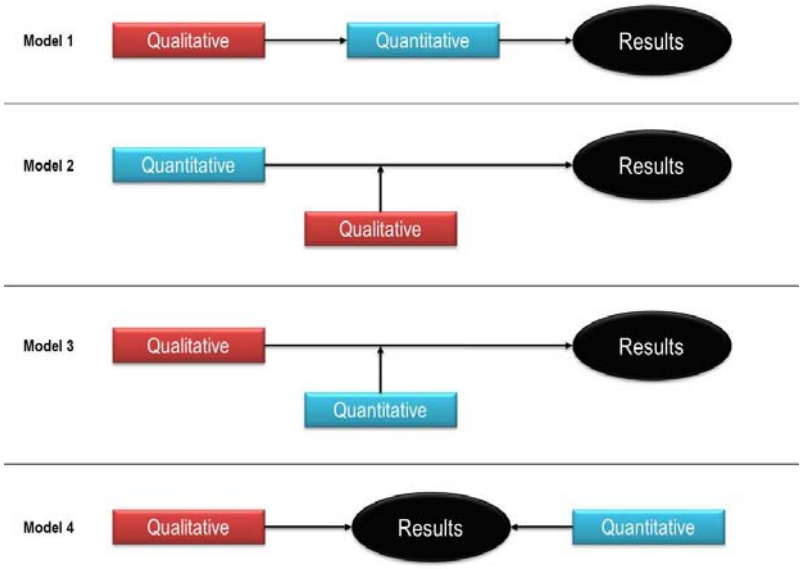

Figure 24. Four models that qualitative and quantitative methods might be integrated (Steckler et al. 1992)

In the first model qualitative methods are used initially to help develop quantitative measures. In the second model the study is predominantly quantitative and the qualitative methods are applied to explain the quantitative findings and to provide a deeper understanding of the research

problems. The third approach is the reverse of the model 2. The final approach (model 4) means that the two methods are used equally and parallel. In this research model 2 is applied. The predominant study is the questionnaire and the reference studies (quantitative), and the deep interviews (qualitative) are applied to gain deeper understanding.

4.6. Quality Criteria

Research quality is typically assessed by evaluating validity and reliability (Arksey & Knight, 1999; Given, 2008; Vilpas, 2014). In this section both of them are examined. In addition, the generalization of the results is discussed.

4.6.1. Validity

The validity of research measures whether the research is actually investigating what it claims to be investigating (Arksey & Knight, 1999; Vilpas, 2014). Validity can be examined by either *internal* or *external* validity (Given, 2008; Vilpas, 2014).

Research is internally valid if an instrument used in a study actually measures what it supposed to measure (Given, 2008) and if the results are legitimately the outcome of the research process (Vilpas, 2014). In quantitative research the internal validity is evaluated by assessing the employed statistical procedures. In qualitative research the evaluation of internal validity is somewhat more complicated. For instance, in most qualitative studies the researcher is the only instrument, and in such situations the reliability of the researcher is difficult to assess. (Given, 2008). Internally valid research always provides an answer to the research problems and questions, and everything that is promised to be conducted is conducted. (Vilpas, 2014). External validity, on the other hand, refers to the likelihood that the findings of the research will apply to the larger population represented by the study's sample. External validity is also referred to as generalizability, which is discussed later (see Section 4.6.3). In quantitative research again the statistical procedures are evaluated. In qualitative research the same problem is encountered as in internal validity, the conclusions based on the researcher's interpretation, not on numbers. (Given, 2008).

As it was mentioned the statistical procedures and methods are important tools to increase validity in a research. Arksey & Knight (1999) have listed more methods of how to enhance the validity of the research:

- establishing trust with the interviewees so that they are open for sharing their true views
- pilot work
- relevant questions based on existing theory
- no irrelevant questions
- encouraging the respondents to elaborate on their initial responses
- a sample that fits the purpose of the research

In this research it can be assumed that the respondents were truthful in most of their answers. This is due to that most of the respondents sounded very interested in the thesis on the phone

before the actual questionnaire. In addition, the respondent rate was relatively high. However, some of the questions were very personal, such as questions related to salaries, and thus some sort of distortion might have happened.

In the interviews trust was established by having as an open and easy atmosphere as possible. The respondents were also encouraged to provide as elaborated initial responses as possible. The questions in the questionnaire and the deep interviews were constructed by following an existing theory. Before the empirical part the questionnaire was also piloted several times. The questionnaire might be considered to have some irrelevant questions unrelated to this thesis. This was done to provide the IDBM faculty as much information about the alumni as possible.

The statistical methods in the research were relatively simple and a deep statistical analysis was not conducted due to two reasons. First, the original survey data of the control group was not available but the data was quoted from the reference survey reports where the original data was already analyzed once. Therefore, for instance, most of the comparison figures from the control group were means of the means from the reference survey reports but not the means of the whole original data. For this reason, an explicit and statistically highly qualified comparison between the target and control group would have been impossible to conduct. Second, the purpose of the quantitative part of the research, on the other hand, was mainly explorative and it aimed to examine the truthfulness of the theoretical framework.

4.6.2. Reliability

Reliability refers to a property of the instruments that are used to measure the phenomena they are studying (Given, 2008). In other words, reliability refers to the assumption that there is an objective truth that can be found when the research design is reliable and does not corrupt the results. (Arksey & Knight, 1999). If another research is executed and the data is analyzed in a same way as in the first one, the reliability increases with the probability that the second results follow the first ones. Hence, the results are not coincidence. (Vilpas, 2014).

In quantitative research the sample size and the data collecting methods are the most important factors that influence the reliability of the research. (Vilpas, 2014). Qualitative research, on the other hand, is situational, conditional and the studied phenomena are typically complex and evolving over time. Therefore the traditional notion of reliability can be deemed inappropriate and complete reliability not attainable. For instance, some other researcher or even the same researcher could conclude different results with the same data under other circumstances. However, some suggestions are represented to assess reliability in the context of qualitative research. These are: *consistency*, *truth value* and *neutrality.* (Arksey & Knight, 1999)

In this research the sample size and the data collecting methods can be considered to be reliable. There is no reason why the results of the study could not be gained from another similar research. The research process, as well as the analyzed results, has been elaborated in this chapter to fulfill the consistency requirement. Truth value is enhanced by triangulation, which refers to combining

different strategies to investigate the research topic, including methodological, data, investigator and theoretical triangulation (Arksey & Knight, 1999). In this research the triangulation is conducted by using both quantitative and qualitative methods to check the results, but also by combining several theories found from literature. As the researcher cannot be totally objective in qualitative research but rather is an instrument of the research, the neutrality requires that the researcher's thinking and actions must be openly reflected on (Arksey & Knight, 1999). Neutrality in this study is supported by having similar and neutral approach to all the questionnaire responders and to the interviewees.

4.6.3. Generalizability of the Findings

Any kind of research based on information can be considered more valuable if the findings can be applied broadly (Vilpas, 2014). In quantitative research the generalization is about statistical significance, whereas in the qualitative research the focus is somewhere else. Even though the main purpose of qualitative research is not to generalize the results, one of the core ideas is to gain a pointer based on the investigated phenomenon to another same kind of study. When examining the individual case thoroughly enough, it is possible to discover what is significant in the phenomenon and what could be happened again in general. However, it should be remember to not to generalize the data itself but the interpretations based on the results. (Saaranen-Kauppinen & Puusniekka, 2006).

In qualitative research important factors to increase generalizability are selecting the data carefully, having comparison studies, and the transferability of the results. The investigated environment and the new environment affect the transferability of the findings. This can be facilitated by a thorough description of the research methodologies. (Saaranen-Kauppinen & Puusniekka, 2006).

In this research the case program and the alumni represent only one multidisciplinary study program in one country, and with one type of mix of the disciplines. Hence, the further generalizations of the findings should be treated with caution. However, some elements that support generalization can be still discovered. The quantitative analysis, if statistically significant, support the generalization. In addition, the two refence studies can be utilized in some extent for generalization purposes.

5. FINDINGS

This chapter provides the most important results that emerged from the empirical part of the research. The questionnaire findings are compared to the data of the control groups. The target group is called IDBM alumni or graduates, as for the control group is called all the business student graduates or alumni, or in singular a regular business student graduate. The first part of the chapter focuses on the findings of the questionnaire and the control group surveys, and the latter part on the four in-depth interviews. If nothing else is mentioned, the scales in the figures of the chapter are percentages.

5.1. Basic Information

In this section the most important findings from the first part of the questionnaire, basic information, is introduced and some of the findings are compared to the reference studies. It is mentioned from which reference study (SEFE or FSD) the results of the control group are.

5.1.1. The Amount of Respondents

The total amount of the respondents of the IDBM alumni questionnaire was 103 which is 56,6 % of the total target group and 82 of the them had been working five years or more. The data of SEFE's survey based on the answers of 14 830 business student graduates, which is 64,0 % of the total amount of graduates between 2000 and 2012 and the data from FSD surveys were from 3430 business student graduates with totally 42,0 % responding rate.

The amount of respondents from each of the IDBM starting years corresponded very closely the actual program business student participants. This is illustrated in Figure 25. Hence, according to this variable the answers correspond accurately the opinions of the IDBM business alumni.

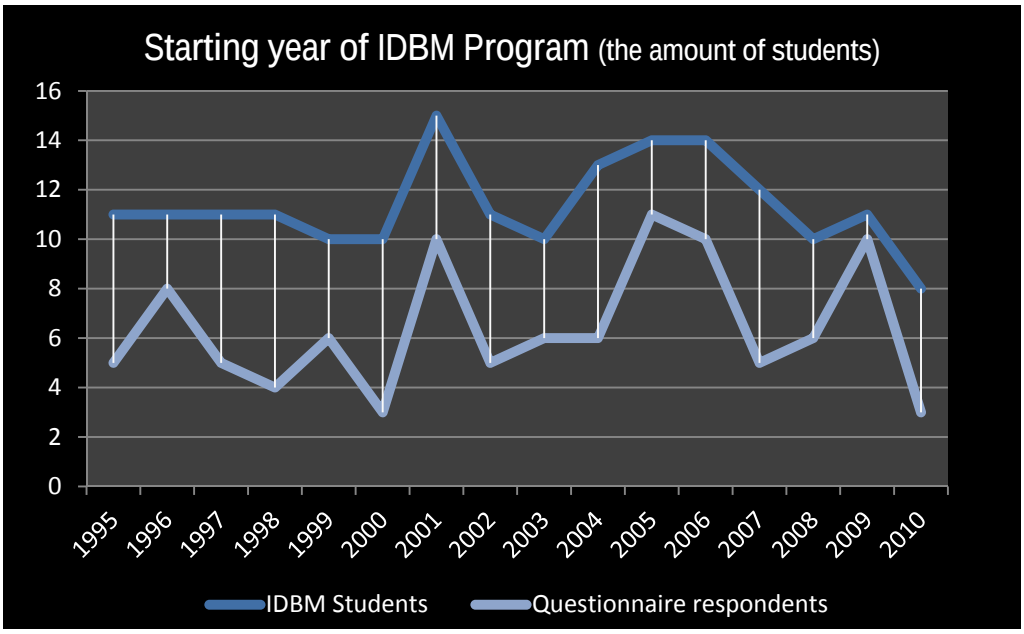

Figure 25. Starting year of IDBM Program. The amount of the IDBM business students and the questionnaire respondents.

5.1.2. University, Gender, Major and Minor

94,2 % of the IDBM alumni have graduated from the Aalto University (or earlier Helsinki School of Economics, HSE). Five respondents graduated from Turku School of Economics and one person from Hanken. When it comes to all the business students annually a little less than 20 % of the graduates are from Aalto University. Therefore the target group consisted of more Aalto graduates in relation to the control group.

In addition to the Master of Science in Economics, IDBM alumni have also completed other degrees (master's or higher): three Doctors in Science of Economics, one Licentiate in Science of Economics, one Doctor of Arts, one Master of Arts, one Master of Science in Technology, one MBA and one CEMS. 4,9 % of the IDBM alumni have completed double degree.

The gender distribution between the target group and the control group was somewhat differ. The distribution of the IDBM alumni and all the business student alumni (SEFE) are represented in Figure 26.

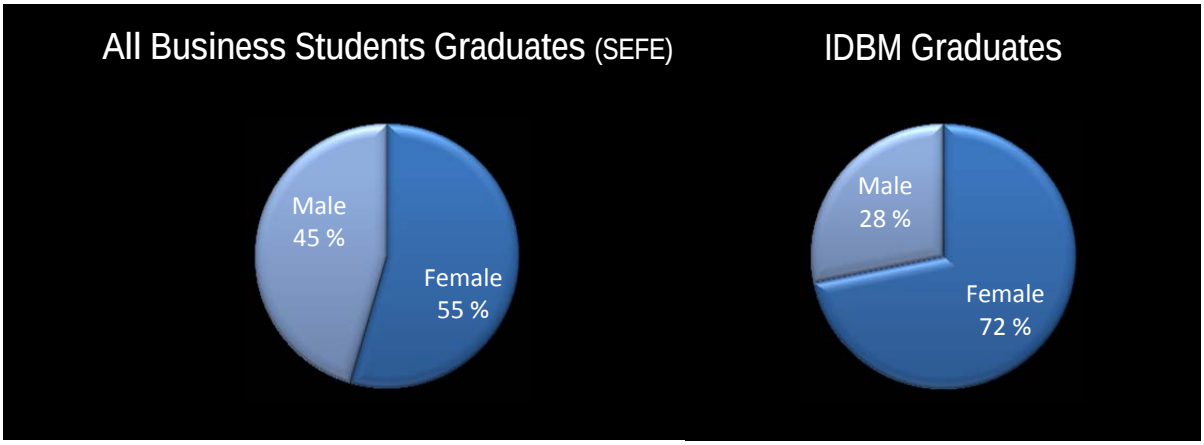

Figure 26. The gender distribution of all the business student graduates and IDBM graduates

From the figure it can be noticed that the amount of female students is higher among the IDBM alumni than among all the business student alumni. Any unambiguous reason for this is difficult to find. For instance, the studying place does not seem to explain the difference. As most of the IDBM alumni have been graduated from Aalto University, School of Economics (HSE) but the gender distribution of all the Aalto University, School of Economics graduates (female 53 % and male 47 %) is closer to all the business student alumni than the IDBM alumni.

The most common major among IDBM alumni has been Marketing 40,2 % followed by International Business 33,6 %. Accounting (23,3 %), on the other hand, has been the most common major among all the business student alumni. The major explains to some extent also the gender distribution. By exploring all the business student graduates whose major has been either Marketing or International Business it can be noticed that the gender distribution is also more female-driven (65,3 %) than in some other majors.

Most of the respondents (62,1 %) had another minor in addition to IDBM, and the three most common minors have been: ITP (Information Technology Program) (20,3 %), Accounting (17,2 %) and Marketing (15,6 %). The three most common minors among all the business student graduates have been: Business Law (25,4 %), Accounting (24,6 %) and Organization and Management (20,9 %).

5.1.3. Studying Time, Graduation Age, Internationality of the Studies and Master's Thesis

IDBM students study on average in 6,8 years (the margin of error ± 0,45), whereas the mean studying time of all the business student graduates is only 5,6 years. However, these figures should be treated with caution. First due to the general reform of the degree the studying times of the control group were surveys only from 2000 to 2008. In addition, either of the results do not reveal whether a graduate has been completed only master's degree or both bachelor's and master's degree. This can fundamentally affect the studying time.

An interesting finding relates to the mean of the graduation ages. A typical business student graduates on average at the age of 28,6 years and from Aalto University (or HSE) at the age of 28,0 years. IDBM alumni, on the other hand, graduates averagely at the age of 26,9 years (the margin of error ± 0,52). This is surprising, because even though the differences in the means of studying times were somewhat misleading, they still suggested that the IDBM students studied over a year longer compared to all the business students.

The internationality, one of the objectives of the IDBM program, was seemed to be fulfilled as 68,0 % of the respondents completed part of the studies abroad (e.g. in student exchange). This is over twice as high a figure compared to all the business students, from which only 33,3 % of the alumni have completed part of the studies abroad. The University does not explain completely the difference either as only 38,8 % of all the Aalto (or HSE) graduates have completed part of the studies abroad. One explanation for the difference might explain the industry project that is compulsory in the IDBM program. Part of the industry project is almost invariably a trip abroad whit the objective to support the project. It is possible that some of the respondents have considered this trip to be studies abroad. Either way, the percentage of IDBM alumni is remarkably high as over two third of graduates have completed part of their studies abroad. It can be assumed that those alumni could have had somewhat better preparedness for the international challenges of working life.

Two thirds (66,0 %) of the IDBM graduates were commissioned to write their master's thesis and 34,0 % did not get any compensation. In all the business student graduates these figures are on the other way round, as only 34,0 % were commissioned to write thesis. 38,8 % of the Aalto (or HSE) graduates got some sort of compensation. These figures might be somewhat misleading as the question related to the commission was not added to SEFE's survey until 2007. However, by exploring the IDBM graduates since 2007 the commission percentage drops to 59,2 %. The difference is still noteworthy and it can be presume that an IDBM student is more often

commissioned to write their master's thesis compared to all the business students. One reason for this may again relate to the industry project of the program. In the industry project, working with the client and with other stakeholders is often very intensive. This might have opened master's thesis opportunities for the student with the client or another company.

5.2. First Job and Job Five Years after Graduation

In this section the most important findings related to the first job and the job five years after graduation are introduced. The most remarkable differences between the target and the control groups are highlighted and possible reasons for the differences are discussed. The main focus is on the job, position, employer and other details such as salary, but also the effect of the university degree is discussed.

5.2.1. Employment Situation

In Figure 27 the employment situation right after graduation and five years later are depicted. A remarkably high amount (79,6 %) of the IDBM graduates had either a permanent or temporary full-time job right after graduation compared to all the business student graduates (68,3 %). Part-time job (permanent or temporary), on the other hand, were more common among all the business student graduates (6,1 %) than among IDBM graduates (1,9 %) right after graduation.

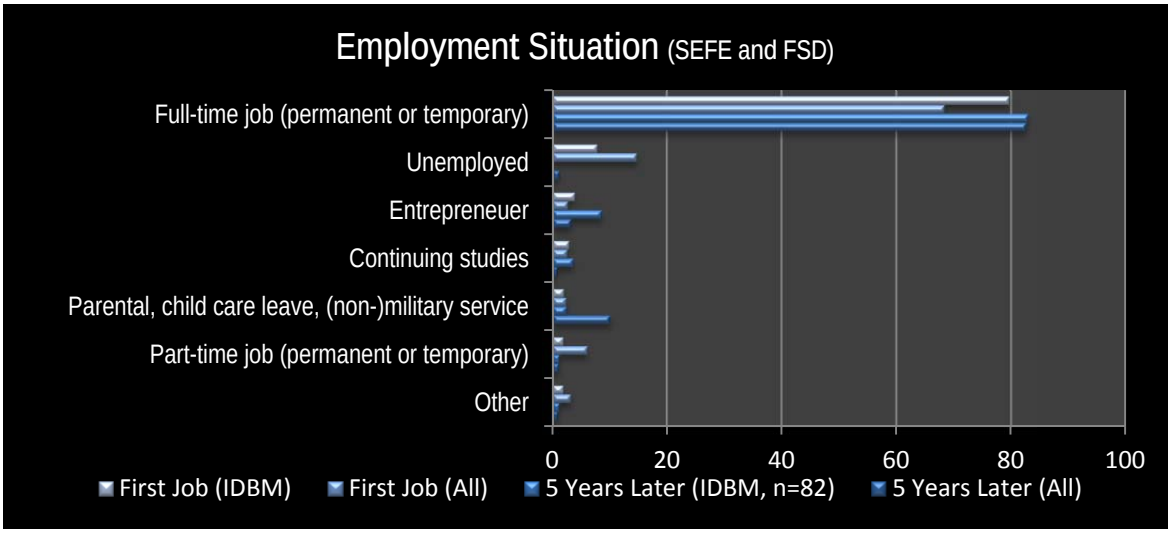

Figure 27. Employment situation of the IDBM graduates and all the business student graduates

Another remarkable difference is the unemployment rate of the graduates: 14,7 % of all the business students, but only 7,8 % of the IDBM students were unemployed right after graduation. From those IDBM graduates who did not have a job right after graduation 26,3 % got job in less than one month and 94,7 % in less than ten months. Five years later both of the groups had a low unemployment rate: all the business student graduates only 1,2 % and IDBM graduates 0 %.

Entrepreneurship has also been somewhat more popular among the IDBM graduates than among all the business student graduates. Right after graduation the difference is not that great as 3,9 % of the IDBM graduates and 2,7 % of all the business student graduates were full-time or part-time

entrepreneurs, but five years later the difference is more noteworthy, as 8,5 % of the IDBM graduates and only 3,3 % of all the business student graduates were full-time entrepreneurs. At least two reasons can cause the difference between the two groups. First, it is possible that averagely more entrepreneurship-minded students, comparing to all the business students, apply to the IDBM program. This statement is also supported by another question from the questionnaire. It was asked whether an entrepreneur career would be an option, and 86,0 % of the respondent answered yes. The second reason can be the program itself: the IDBM Program might encourage students to become entrepreneurs more than other programs.

According to these results it can be assumed that employment right after graduation has been somewhat easier for IDBM graduates comparing to all the business students. With this information it is impossible to evaluate whether the program causes the difference. Either way it is a positive sign of the IDBM program. Five years later, as mentioned earlier, the greatest difference relates to entrepreneurship. In addition, a regular business student graduate is more often in parental leave, child care leave or doing her or his military or non-military service compared to an IDBM graduate.

The answers for the question of how the respondent got their first job after graduation are shown in Figure 28. This question was not included in FSD surveys, and therefore the results of how a regular business student graduate got her or his job five years after graduation are not available.

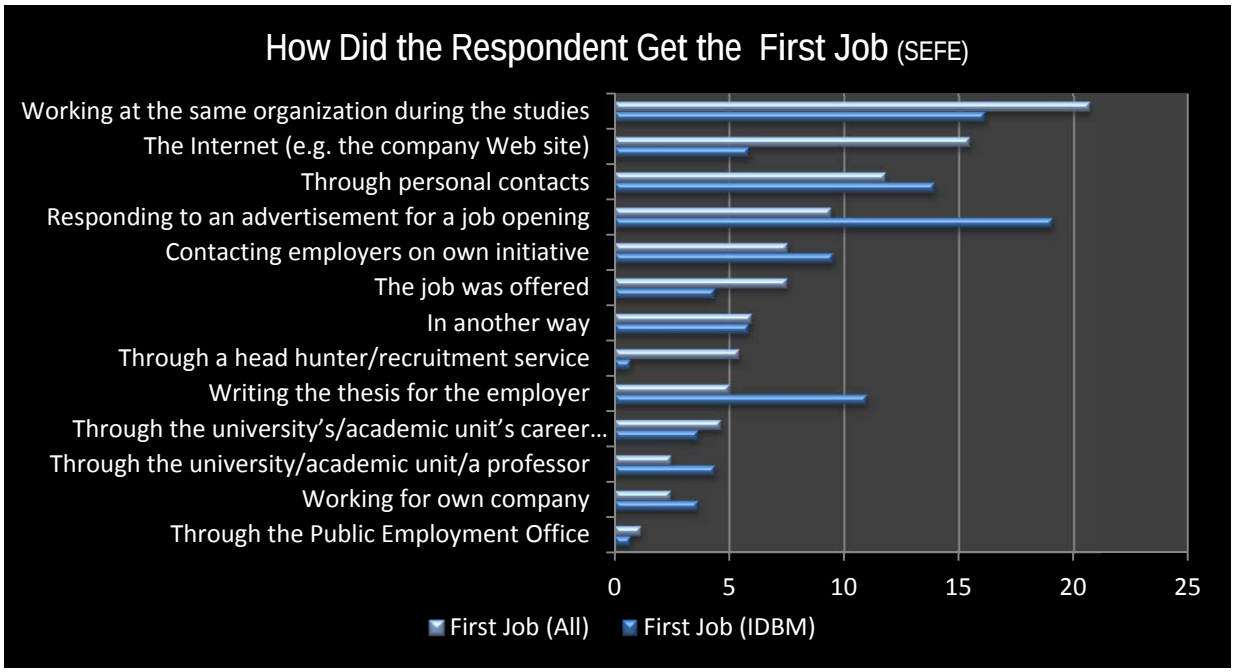

Figure 28. The methods how did the respondent get the first job after graduation.

From the figure some notable differences can be discovered. For an IDBM student it has been more common (11,0 %) to continue working for the employer for which he or she wrote the master's thesis for than for a regular business student (5,0 %). However, as it was mentioned earlier, writing a thesis under commission has been overall more common for IDBM students,

which probably mostly explains the difference. A regular business student graduate, on the other hand, has more often received the first job by working at the same organization during the studies than an IDBM graduate. This has been also the most common way to get the job (20,8 %) for a regular business student graduate. It is also interesting to notice that only one IDBM graduate (0,7 %) has got her or his first job through a head hunter or recruitment service whereas among all the business students the percentage is 5,5 %. It is difficult to state a single reason for what causes the difference but it can relate, for instance, to the major of the graduates or their gender.

The results of whether the academic degree was a requirement for the first job or for the job five years after graduation are depicted in Figure 29.

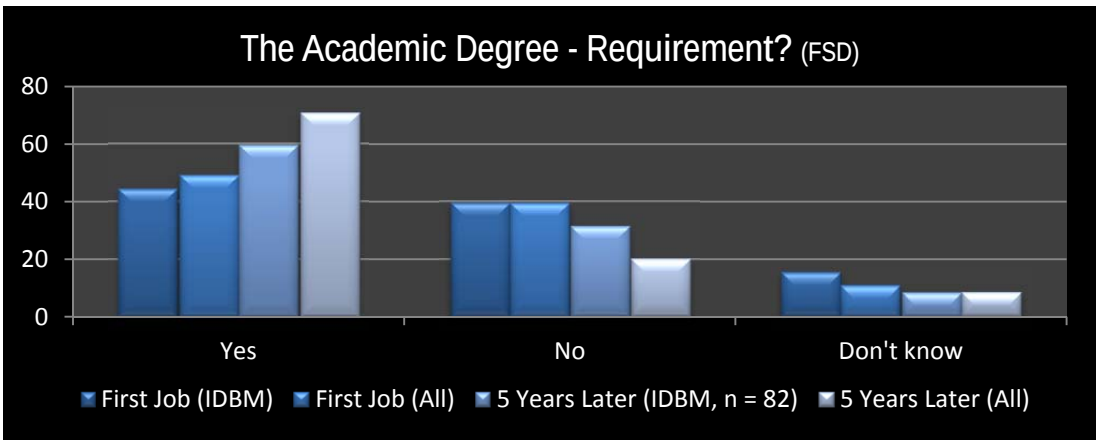

Figure 29. If the academic degree was a requirement for the first job and for the job five years later

For the first job the academic degree was or was not a requirement almost equally often: 44,7 % of IDBM graduates and 49,3 % of all the business student graduates answered that the degree was a requirement in the first job, and about 40 % of both groups answered that the degree was not a requirement. It was somewhat more common among the IDBM graduates (15,5 % vs. 11,0 %) that they did not know whether the degree was a requirement or not.

Five years later the requirement of the academic degree was more common in both groups: 63,1 % of the IDBM graduates and as much as 71,0 % of all the business student graduates answered yes. The percentages are relatively high and it can be considered that the academic degree has influenced on the working careers of both groups.

5.2.2. Employer, Position and Main Duties

No remarkable differences between the employer of the target group and the control group occurred, which can be seen in Figure 30. About three out of four business students start their working career in the private sector and only about 15 % in the public sector. Five years later 77,7 % of the IDBM graduates and 77,4 % of all the business student graduates worked in the private sector. 16,0 % of all the business student graduates but only 3,7 % of the IDBM graduates worked in the public sector.

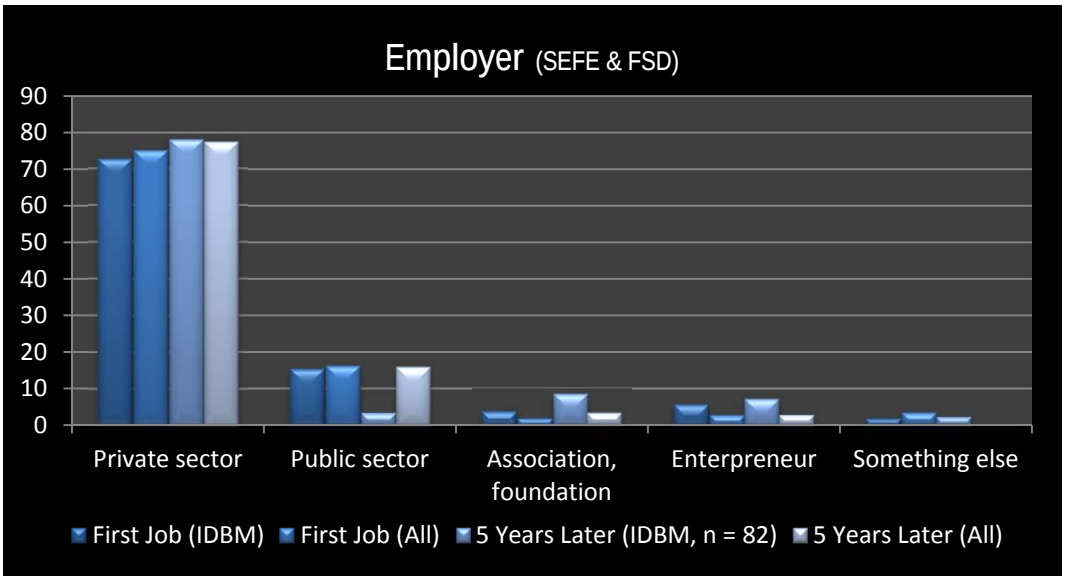

Figure 30. The employer of the first job and the job five years after graduation

The same thing that could be noticed from Figure 27 can be also seen in Figure 30: entrepreneurship is more common among IDBM graduates compared to all the business student graduates. However, it is also interesting to notice that when comparing the two figures – the percentages of entrepreneurship – especially among the IDBM graduates, they were higher in the employment situation question than in the employer question. This can the result of some of the respondents possibly being be somehow involved in entrepreneurship but their main employer being someone else.

The most common employers of the IDBM graduates in their first job and five years later were Aalto University (or part of it, e.g. HSE), Nokia and Accenture. 10 IDBM graduates started their working career in Aalto University and five years later 9 student worked in the same institution. Nokia and Accenture were both the first job for 4 IDBM graduates and five years later 3 IDBM graduates worked in both of the companies.

No remarkable differences in the employers of the graduates occurred. Same cannot completely be said of the positions of the first job (Figure 31). From all the business student graduates almost half (45,1 %), but from the IDBM graduates as much as almost two out of three (65,0 %) were some sort of specialists in their first job. A regular business student, on the other hand, was much more often an office or civil service employee (not in all executive position) (28,7 %) than an IDBM graduate (3,9 %). However, a regular business student graduate was almost twice often in a management position (14,9 %) in his or her first job than an IDBM graduate (8,7 %). It is an interesting result because in total 25 IDBM graduates (24,3 %) had a title which included a word manager in their first job. In addition, in the end the IDBM program is a management program, which should indicate probably somewhat higher percentages than in the control group. Unfortunately this question was not in the surveys of FSD and therefore the comparison of the position five years after graduation between the two groups cannot be conducted.

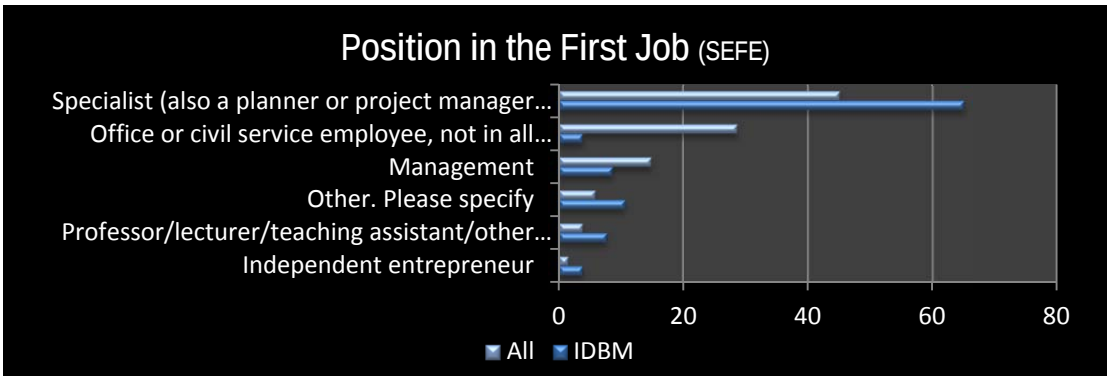

Figure 31. Position in the first job.

By exploring more deeply the nature of the first job it can be discovered that the most common main duty or task of the IDBM graduate in his or her first job is marketing or selling (33,0 %). As for all the business students the most important duty or task is financing and economic management (22,1 %). The nature of the first job is introduced more precisely in Figure 32. The results of all the business students base on FSD surveys. This figure also proves the finding of the last section, that a regular business student graduate has had more often leadership or management duties than an IDBM graduate.

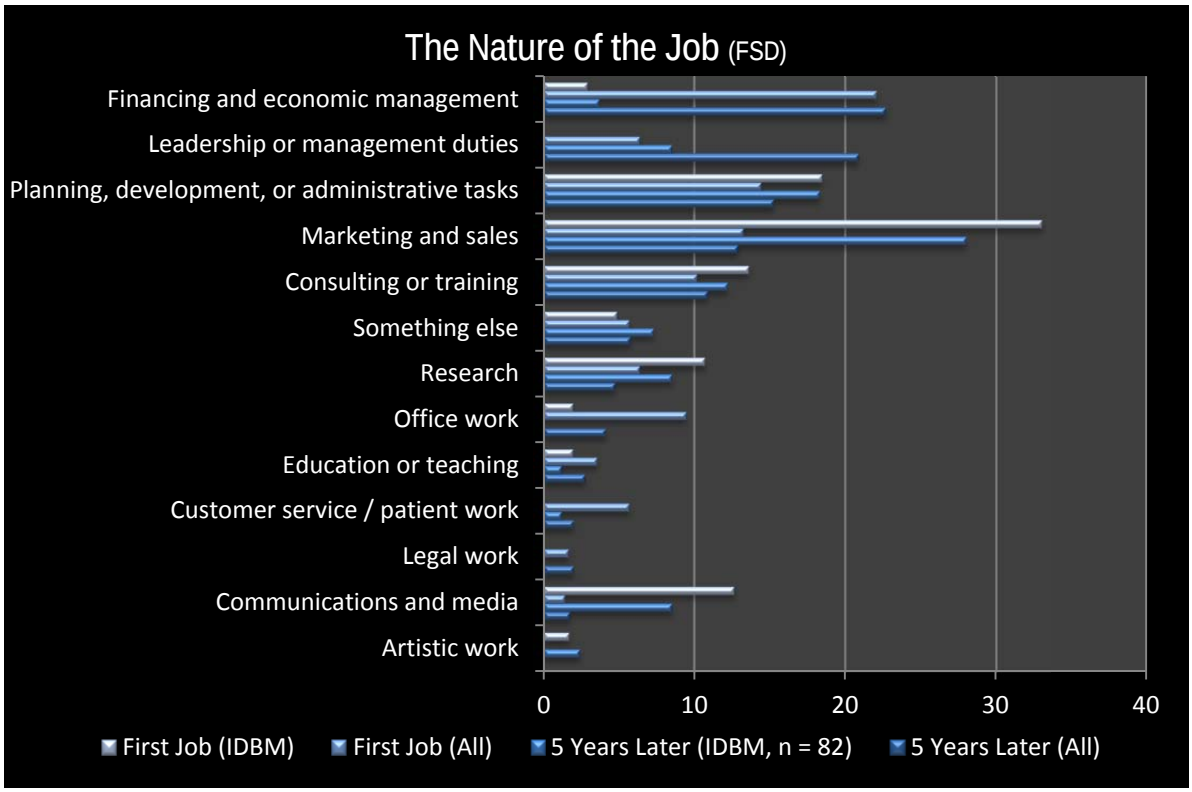

Figure 32.The main duties or tasks of the first job and the job five years after graduation

5.2.3. Salary

Figure 33 depicts the means and medians of the gross salaries. The means of the gross salaries of all the business students are calculated by taking the mean of the means from the annual

reference studies' reports. The medians of the gross salaries of all the business students are calculated by taking the means from the medians reported in the reference studies.

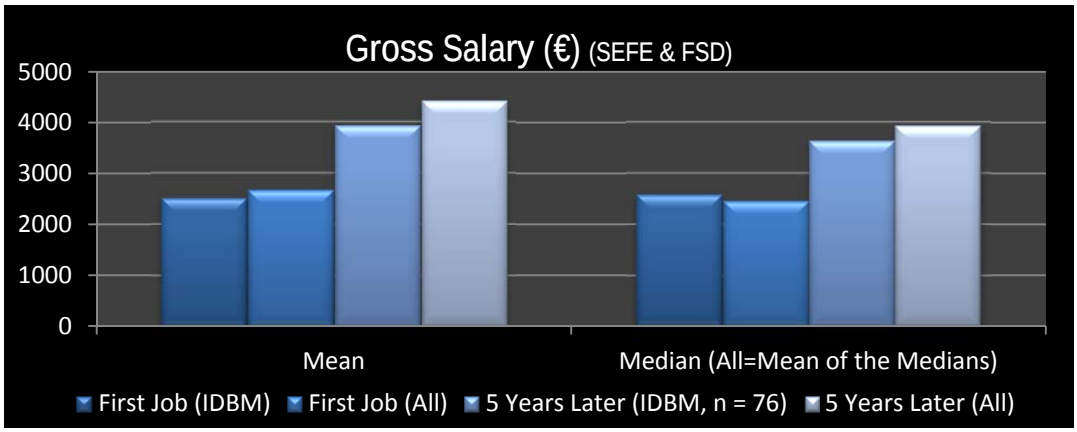

Figure 33. The means and medians of the gross salaries in euros

As it can be seen, no remarkable differences in the salaries of the first job between the two groups exist. The mean gross salary of IDBM graduate in the first job has been 2527 € whereas all the business student graduates have earned averagely 2685 € in their first job. The median gross salary in the first job, on the other hand, has been 2600 € for IDBM graduates and the mean of the medians for all the business student graduates has been 2470 €.

However, five years later some there are some significant differences in the gross salaries. In his or her job five years after graduation an IDBM alumnus has earned averagely 3947 € a month, whereas the same figure for a regular business student is 4427 €. Also the median gross salary five years after graduation has been higher among all the business students (3948 €) than among IDBM graduates (3650 €). It is impossible to find an unambiguous reason for the differences because the results are not fully comparable; however some educated guesses can be made. Firstly the sample of the target group in this question was relatively small, as there were only 82 IDBM graduates who had been in the working life five years or more and 76 of them provided an answer for this question. Therefore the reliability of the IDBM results is not as high as in most of the other questions. Secondly, the gender of the IDBM graduates can also explain the difference at some level. As it was discussed earlier, there are relatively more female students in the IDBM program comparing to all the business students. According to SEFE's studies, the last 15 years a female business student graduate has earned averagely 75 % of the male business student graduate's salary. Hence, as there have been relatively more female students in the IDBM program, it is natural that also the mean and median gross salaries of the IDBM graduates are relatively lower compared to all the business student graduates. The third reason that explains the difference at some level relates to the major program of the students. According to SEFE's studies Accounting and Finance are typically very popular major programs among all the business students, for instance in 2012 almost 30 % of all the graduates had one or the other or both as a major. By investigating the gross salaries, it can be discovered that the students who have completed either of the two major programs usually earn significantly more compared to

students with another major. As it was discussed earlier, most of the IDBM students have had Marketing or International business as their major, and from the 76 respondents only 2 had either Finance or Accounting as a major. Therefore, as there have been relatively fewer students with Finance or Accounting as a major in IDBM program, also the gross salaries are relatively lower.

As it can be seen many reasons can be discovered which explain why the gross salary of the IDBM graduates five years after graduation have been lower compared to all the business student graduates. However, reasons why it should be higher can been also found, for instance almost all of the IDBM respondents have graduated from the Aalto University (or HSE) in Helsinki and according to SEFE's studies a business student graduates from Helsinki earns on average more compared to the rest of the universities.

Due to multiple reasons that can or should cause the differences one way or the other, it is not reasonable here to try to conclude that IDBM causes differences in business graduates salaries. Rather it can be stated that no remarkable differences in the gross salaries of the first job between the target and the control group were found, but five years after graduation a regular business student graduate earns averagely somewhat more than an IDBM graduate. To fully understand what causes the difference, further research should be conducted.

5.3. Studying Experiences

In the questionnaire the participants were asked to assess the merits the university degree gave in terms of how well it prepared the respondent to working life. The question was quoted directly from SEFE's survey to gain comparable results. However, the analyzing of the data turned out to be difficult due to the differences in the Likert grading scales. In SEFE's questionnaire, between 1999 and 2010 the university degree was assessed in the scale of 4 to 10 and since then in the scale of 1 to 5. The scale in this research was 1 to 5. Hence, the results are not compared numerically but they are listed in the orders from the lowest to the highest grade (Table 4)

Table 4. The merits the university degree provided

The Lowest Grades			
All Business Student Graduates (1999-2010)	Entrepreneurial skills, intellectual	Entrepreneurial skills, attitudinal	IDBM Graduates
	Entrepreneurial skills, attitudinal	Entrepreneurial skills, intellectual	
	Skills in human resources / management	Skills in human resources / management	
	General leadership skills	Data processing skills	
	Scientific ability	General leadership skills	
	Ability in your minor subject / minor studies	Scientific ability	
	Data processing skills	General knowledge of economics	
	Communication skills in other languages	Ability in your major subject / study program	
	General knowledge of economics	Ability in your minor subject / minor studies	
	Ability to work internationally	Ability to perform in public	
	Ability to perform in public	Communication skills in other languages	
	Ability in your major subject / study program	Ability to interact	
	Ability to interact	Ability to work internationally	
	Ability to solve problems	Ability to solve problems	
	Team-working skills	Ability to learn new things	
	Ability to learn new things	Team-working skills	
The Highest Grades			

As it can be seen there are no remarkable differences in the orders. The university degrees, with or without IDBM Program, do not provide that much merits in entrepreneurial skills, human resource, management or leadership skills and neither in scientific ability. Ability in the minor studies gained relatively somewhat higher scores among the IDBM graduates than among all the business student graduates. However, any further conclusions from that cannot be made due to the lack of numerical comparison.

In both of the groups the three merits the university degree provided most were: the ability to learn new things, team-working skills and the ability to solve problems. The ability to work internationally and communication skills in another language gained relatively higher scores among IDBM graduates, whereas all the business student graduates assessed they gained relatively more merits in the ability in the major subject.

Even though no remarkable differences in Table 4 occurred, some differences between the two groups can be found. In the SEFE's survey there is another Likert-question where the respondent was asked to rate the university and the education. The same multiple choice questions were also used in the questionnaire of this research. However, the respondents were asked to assess the IDBM Program and its education, rather than the whole university. The results of this question are depicted in Figure 34. The scores are the means from the questionnaire and from the SEFE's surveys; the higher the scores the better.

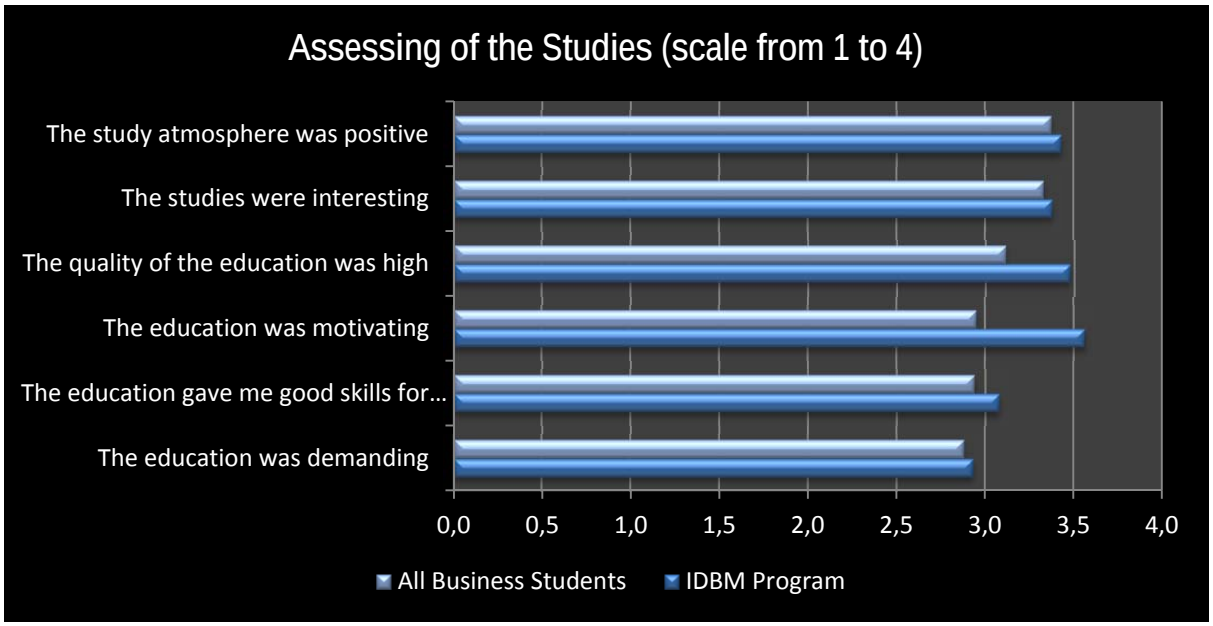

Figure 34. Assessment of the university and the education; and the IDBM Program and the education

As it can be seen from the figure, the IDBM graduates have assessed all the means higher compared to all the business student graduates. Both of the groups considered that the study atmosphere was positive and that the studies were interesting. The IDBM studies, on the other hand, were assessed to be of higher quality compared to all the business studies. All the business student graduates rated the quality of the education to be averagely 3,1 while the same number

for IDBM graduates was 3,5. An even greater difference was found related to motivation. All the business student graduates gave averagely 3,0 to the statement that the education was motivating, as the IDBM graduates gave 3,6. The difference is remarkable, and thus it can be stated that the studies in the IDBM program are more motivating compared to other business studies. According to Figure 34, the IDBM program also provided somewhat better skills for work life and the education was also mildly more demanding than the business studies in general.

5.4. The Extra Value of the IDBM Program

In addition to the statements in Figure 34, there were other statements in the questionnaire where the respondents were asked to assess the IDBM Program more profoundly. The results of these statements are depicted in Figure 35. The mean of all the statements was 3,2 which can be considered to be relatively high in the scale from 1 to 4.

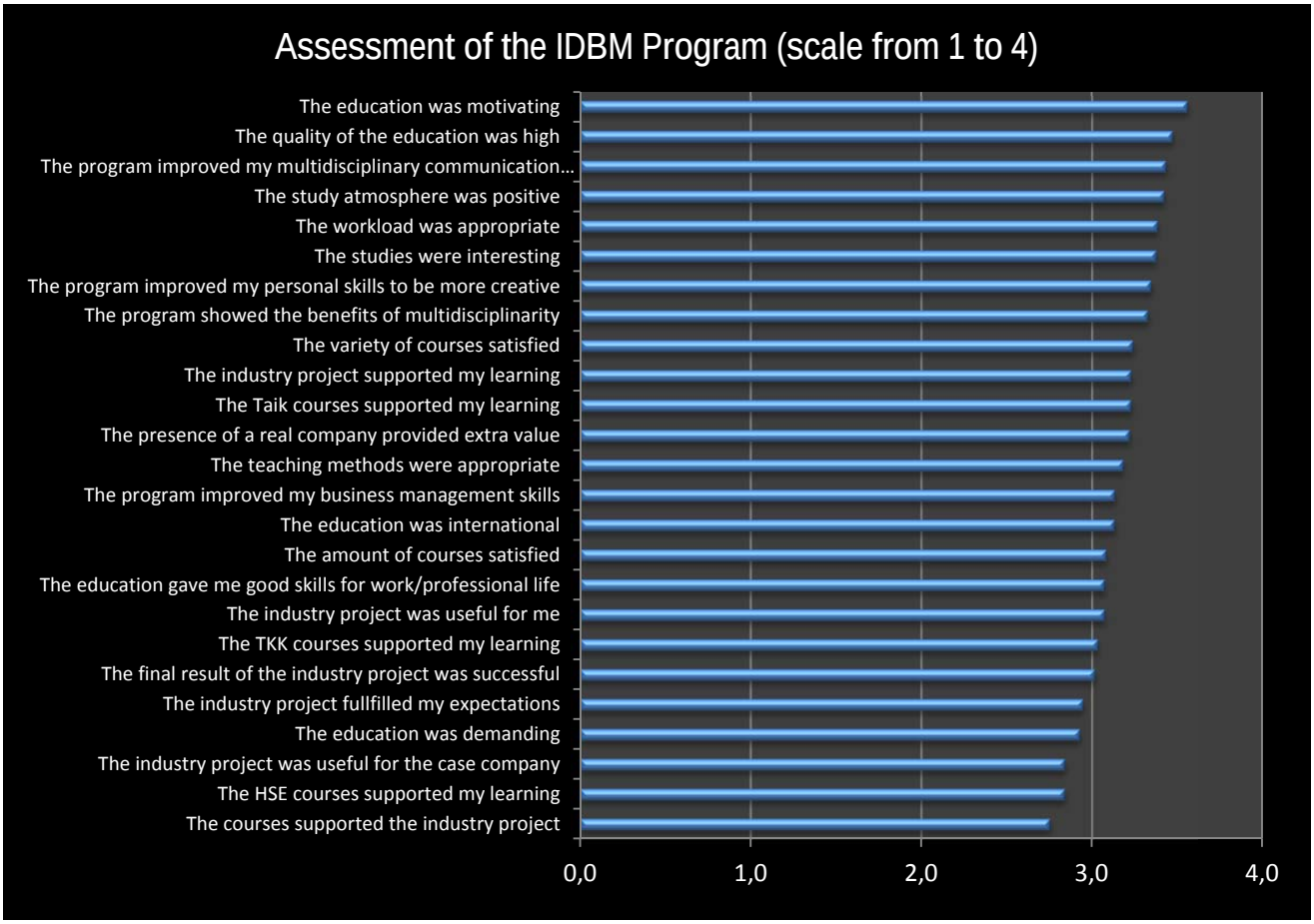

Figure 35. The assessment of the IDBM Program

Figure 35 shows interesting and valuable information about the IDBM Program. As it became clear in the previous section, the respondents considered that the education of the program is motivating (3,6), the quality of the education is high (3,5) and the study atmosphere is positive (3,4). Interesting is also to see that the program improved the respondent's multidisciplinary

communication skills (3,4) and the personal skills to be more creative (3,4). In addition the respondents considered that the program showed the general benefits of multidisciplinarity (3,3).

According to the respondents the courses could have supported the industry project more (2,8), the HSE courses could have been better (2,8) and the education could have been more demanding (2,9). The respondent also considered that the industry project could have been more successful (3,0) and more useful for the case company (2,8). The industry project could also have fulfilled the expectations of the respondents better (3,0). However, as it can be seen the statements are overall rated relatively high, which indicates that the respondents are relatively satisfied with the program.

5.4.1. The Impact of the IDBM Program on Working Career

In the last section of the questionnaire there were statements related to the impact of the IDBM program on the working career. The idea of the statements was not to compare the two groups, thus the statements cannot be found from the reference studies. The statements aimed more to reveal whether the program has or has not had an impact on respondents' working careers. All the statements had three answer options: "yes", "no" or "don't know". In the following sections "don't know" answers are removed to get a clearer picture.

Most of the IDBM graduates (90,2 %) have utilized the knowledge they learned in the program in business management during their working career. Over half (60,2 %) of the respondents have also applied the methods they learned in the IDBM Program during their working career. The most common methods mentioned in the open answers were: brainstorming, team working, multidisciplinary methods such as multidisciplinary teams and product design.

40,3 % of the respondents considered that the knowledge they learned in the IDBM Program have brought significant extra monetary value to the business they have been involved in and 56,8 % of the respondents thought the knowledge they learned has brought other significant extra value to the business they have been involved in. In the latter question they were also asked to specify what these other things are, and the open answers included for instance contacts, product development skills and designing skills. However, the most common piece of knowledge related somehow to multidisciplinarity, as it was mentioned 8 times in 40 open answers.

Almost all the IDBM graduates (96 %) have worked in a multidisciplinary team during their working career, and 78,2 % of the respondent have been involved in the creation process of multidisciplinary teams. It is notable that over two out of three (68,4 %) of the respondents stated that the multidisciplinary team brought significant extra monetary value to the business. Over two out of three (68,0 %) of the respondents have been involved in an innovation creation process, and most of them (totally 58,9 %) have utilized IDBM knowledge in the innovation creation process. Two out of three (64,0 %) respondents state that the innovation/s brought significant monetary value to the business.

According to the results of this section, it can be concluded that the IDBM graduates have utilized the learned knowledge, especially knowledge relating to multidisciplinary and teamwork, in their working life. They have applied methods, such as multidisciplinary team work, they learned from the program. The multidisciplinary teams, as well as the innovations created by utilizing IDBM knowledge, have created significant extra monetary value in the businesses the respondents have been involved in.

5.4.2. The Reputation of the IDBM Program

The respondents were also asked to evaluate in Likert scale the general reputation of the IDBM program and the direct influence of the program on their career. The answers are means on the scale from 1 to 4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Figure 36 summarizes the answers.

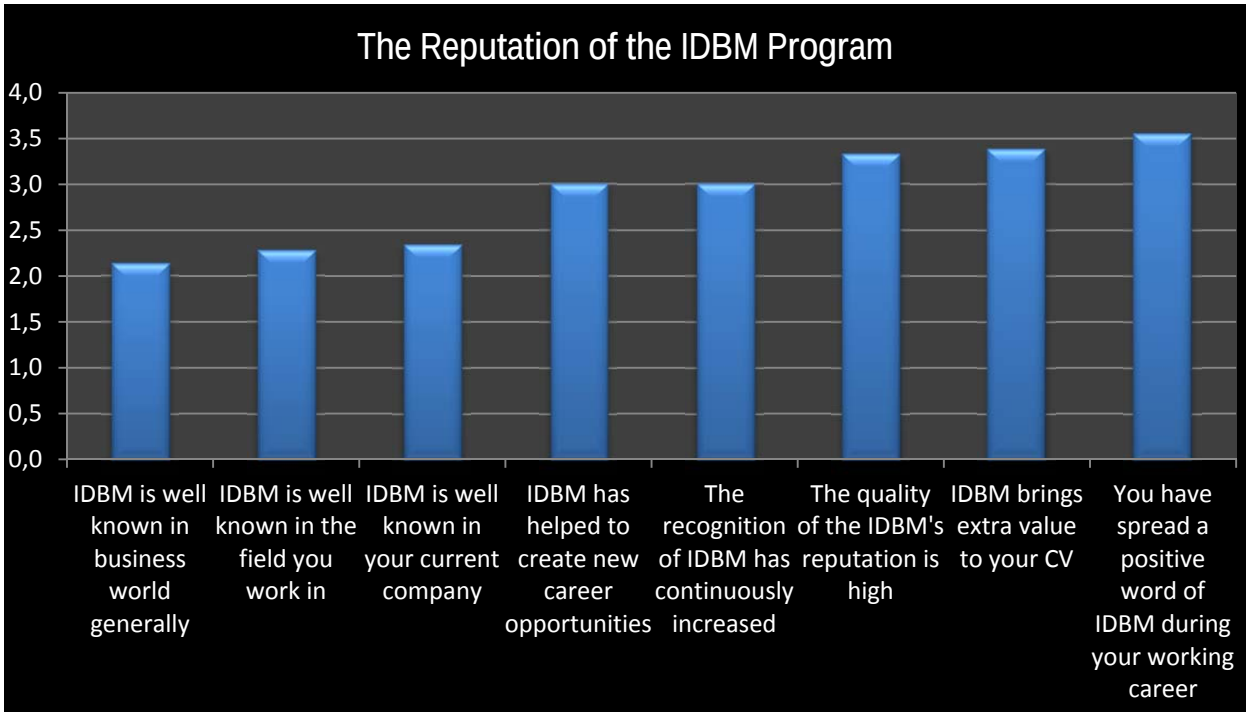

Figure 36. The reputation of the IDBM Program

As it can be seen the IDBM graduates appreciate the program relatively highly, as most of the respondents have spread a positive word of the program during their working career (3,6), and the program is also considered to bring extra value in their CV (3,4). The quality of the IDBM's reputation is also relatively high (3,3).

Even though the recognition of IDBM has continuously increased to some extent (3,0), the program could be better known as the numbers are: in the business world generally (2,1), in the field the respondent work in (2,3) and in the current company the respondent works at (2,3).

Almost all the IDBM graduates (96,1 %) would recommend the IDBM program to a friend, hence most of the alumni had a positive experience with the program. However, the friend relationships created in the program could have assumed to be somewhat tighter, as only half of the respondents (52,4 %) have been contact with their IDBM student friends after the program.

5.5. In-depth Interviews Findings

As it was mentioned earlier, one of the objective of the questionnaire was to investigate whether the findings in the theoretical framework happen in reality or not, whereas the in-depth interviews explored the reasons and phenomena more profoundly. This section summarizes the in-depth interviews. The section is divided into the themes discussed in the interviews, which follow substantially the building blocks of the theoretical framework. The supporting questions of the interviewees can be found in the Appendices.

5.5.1. Understanding the Value of Interdisciplinarity – The Contribution of the IDBM Program

"For me the IDBM program provided a real moment of awakening and it decided the direction of my career" (Female, IDBM 1995).

Most of the interviewees considered that the IDBM minor program has had a remarkable influence on their understanding of the value of interdisciplinarity. The program made the interviewees understand that bringing specialists to work together can create positive synergy and can result to a better outcome. In addition, most of them considered that for an IDBM alumnus it can be much easier to create and work in such a working environment. One interviewee stated that it was the very program that eventually decided the direction of her career. Since the program, all her jobs have related also somehow to design. Two other interviewees stated that even though the program made them to contemplate the potential value of interdisciplinarity, it was not until in working life, when they fully understood the actual value interdisciplinarity or cross-functionality can provide. The other, for instance, explained that the understanding happened when he was a project manager of a cross-functional team. In that project he worked in the middle of everybody and realized that he has to be able to communicate not only about the feasibility with an engineer but also about the usability with a graphic designer.

"IDBM make me understand that interdisciplinary working methods are not an exclusive right for talented persons, neither are they a magical trick" (Male, IDBM 2005).

The interviewees were asked why the very IDBM program provided a suitable environment to understand the value of interdisciplinarity, and what practical interdisciplinary working methods the program provided. A common opinion among all the interviewees was that in the IDBM environment natural interaction occurred with the students from different backgrounds. And because the interviewees got used to this already in their studies, they were more prepared for cross-functional team work in the business world. Another reason was the intensive industry

project, which forced (in a positive way) people to understand different disciplines. The field of problems in the industry project was also considered to be very close to those problems occurring in real life, and that prepared the interviewees even more for challenges in working life. In addition, some of the courses from other disciplines (such as Product Development Project in the School of Science and courses in the School of Art) were considered to be revolutionary experiences in understanding the extra value of interdisciplinarity. In these courses the interviewees learned several practical methods, such as project management, brainstorming or innovation methods, which the interviewees have utilized in their working careers. One interviewee mentioned that the advantage of the program was the length; it was long enough to make the students to fully understand interdisciplinarity and to familiarize the team members of the industry project thoroughly with each other. One alumnus added that, for him, the most important reason of the suitable environment was the program's outstandingly fun atmosphere.

5.5.2. The Extra Value of the T-Shaped Compentence

"The term interdisciplinarity evokes positive thoughts among employers" (Male, IDBM 1998).

All the interviewees stated that the IDBM program in the CV has had a positive influence on their working career. The main reason was simple: the interdisciplinarity was generally considered to be a positive thing. One alumnus explained this by stating that most customers and employers consider that an employee or a student with a capability to see a wider scope has a remarkable advantage compared to a person who has focused only on a single discipline. Another interviewee described that because of her IDBM background, she has been able to do freelancer consulting work alongside her main job. For the third interviewee the IDBM background opened the door for her first job, even though the company did not have an active recruiting process going on. The same interviewee believed that IDBM in a CV provides positive view about a person's proficiency and increases his or her credibility in the employers' perspective.

According to the interviewees the most important extra value factor the IDBM program provides is the T-shaped competence: especially the communication skills, management skills and knowledge among distinct disciplines. Most of the interviewees stated that the T-shaped competence has been especially valuable in everyday management duties, which is emphasized in cross-functional team working. Even though the individuals of the cross-functional team does not have the interdisciplinary capability, the team, if managed properly, can have the T-shaped competence, and thus, better results can be achieved.

"A person with I-shaped competence becomes typically a specialist or, at the most, a manager in a standard division. A person with T-shaped competence, on the other hand, becomes more often a general manager or director because of his or her view is wider and more comprehensive" (Male, IDBM 1998).

The interviewees were asked to compare a "T-shaped competence person" with an "I-shaped competence person" in working life. Most of the interviewees considered that the T-shaped

competence definitely provides competitive advantage in the employment markets. One interviewee stated that it can be seen at first sight whether a person has the T-shaped competence or not. She explains this by saying that the T-shaped person does not typically get stuck on issues or problems and he or she is not too proud to ask consulting help from specialists. According to the same interviewee, the I-shaped person, on the other hand, is often overly narrow-minded, not responsive enough and thus he or she does not progress in the job that effectively. Another interviewee explained the difference by providing an example: in his previous job there were plenty of specialists focusing on one field but in the interviewee's daily job, the most important required skill was his capability to communicate with the specialists. He added that because he was also interested in other disciplines, he learned many new things in his everyday tasks. Learning new things, on the other hand, has opened completely new career opportunities to him. The third interviewee stated that the IDBM background is often a benefit because this kind of person is typically more enquiring than a specialist of a single discipline.

However, most of the interviewees also stated that it should not be generalized that a person with T-shaped competence is automatically more successful in the business world compared to a person with I-shaped competence. The interviewees said that the success always depends more on an individual. One interviewee also discussed the possibility that a specialist, an I-shaped person, might not have team or group working experience, and therefore it is not about the lack of skills of understanding the value of interdiscipliarity but about the lack of experience. It was also reminded that there were remarkable differences among the students in the IDBM program, and not all the students fully understood the value of interdisciplinarity.

5.5.3. Cross-Functional Teams in Working Life

"I have seen in practice, what people from different functions can bring at its best to the (cross-functional) team working; in those cases 1 + 1 + 1 = 5" (Male, IDBM 1998).

All the interviewees considered cross-functional teams to be valuable in working life, and one interviewee even stated that all her work tasks occur in cross-functional teams. At its best, a cross-functional team creates positive synergy but, on the other hand, if the team members are too narrow-minded, the synergy can also be negative. The composition of an optimal cross-functional team was seen depending on the objectives of the work. In project work, it was seen as very important that the project manager was capable of understanding all the team members to avoid irritation among the members caused by a misunderstanding. On the other hand, a project manager who is capable of discussing about several issues and who is willing to dig the accurate solutions gains often higher appreciation among cross-functional team members, which results to a higher overall motivation.

"As ninety percent of the workers are engineers, it is important that someone thinks of where the business value of the product is, and how to sell and market the product. If I don't do that, no one else will either" (Female, IDBM 2006).

Two interviewees stated that it has been unfortunately common in the Finnish IT-sector that the invented products have been developed too often only by an engineer with no sense of the user interface or of the business model. In these cases, the product itself might have been a great invention, but not a great innovation. Hence, again, a solution provided by the interviewees was cross-functional teams executing the innovation process, which results to more comprehensive and functioning solutions.

The interviewees considered that the most important factor of a good cross-functional team is the general team working skill. In other words, the interviewees stated that there are essential basic skills always required in an effective team working, skills such as: the ability to work with all kinds of persons, at any age and from different backgrounds, and the ability to listen. According to the interviewees these skills can be taught but only to some level – the good team working skills were considered to also link up strongly with personality. Therefore, the choice of the right persons to the team was seen to be vital. The interviewees emphasized that, in cross-functional teams, it is vital that all the team members are team players in the sense that they understand the potential extra value of the cross-functionality. One interviewee stated that when evaluating the final result of the cross-functional project, the team working process is at least as important as the initial idea. The alignment of the team members' disciplines are discussed in more detailed in the next section.

"Sometimes designers want to take too large a role and end up designing something that is not optimal from a business perspective. Also, sometimes IT-engineers want to do something novel only, because no one else has ever done it before" (Male, IDBM 2005).

The results of the questionnaire showed that interdisciplinarity can often bring significant monetary extra value to the businesses. In the interviews it was asked how this has happened in practice. One interviewee responded that the interdisciplinary educational background has significantly facilitated project management or managing the project managers. In conflicts, the same interviewee has been capable of asking opinions from various people, and able to interpret issues more precisely. These have resulted in a more fluent overall process and finally to a better outcome, and that has caused extra monetary value to the business. Three interviewees also emphasized the positive influence of interdisciplinarity in innovation work. One stated that in the beginning of an innovation project, a project manager with T-shaped competence can explain the objectives of the project in an inspirational way to all the team members, which results to a highly motivated team, doing better innovations and thus achieving more profit. The other interviewee, on the other hand, considered that the interdisciplinarity increases innovation possibilities, which she thought is vital in development. She concluded that, as the continuous development is the prerequisite to survive and to succeed in the current markets, interdisciplinarity is definitely one source for better monetary results. The third provided two concrete examples, where the innovation was a result of a cross-functional team work. The first innovation finally ended up to be the company's main product, and hence the biggest money maker; whereas the other

innovation ended up to create much functional operations among other companies and stakeholders, and thus created indirect positive extra monetary value.

Even though interdisciplinarity was generally considered as a profit increasing factor, one interviewee also reminded that this is actually very difficult to measure in practice. For the measurements, a control group would be needed in which no kind of interdisciplinarity would be implemented, and compare the results with the results of the cross-functional team. However, he added that no matter what the real monetary effect is interdisciplinary practices create a possibility to gain higher profit.

5.5.4. How the Diversity of Knowledge Effect?

"Theoretically, the further the team members' disciplines are, the better chances there are to create better innovations" (Male, IDBM 2005).

The quote from an interview above describes the same conclusion as the Fleming's (2004) theory represented in Section 3.5.2. The interviewee stated that the theory can be seen at some level in practice as well. According to him, it is exposed especially when the team members' disciplines are close to each other: in these situations, the innovations are rarely extraordinarily good. He also emphasized that from a business perspective, innovations created by a heterogeneous (cross-functional) team are averagely much better compared to the innovation created by a homogeneous team. He adds that in homogenous teams the deep expertise of the team members can sometimes be problematic, for instance: if four designers form a team, they may have serious difficulties to solve even the initial design problem not to mention to create something novel. This is due to that everybody in the team knows "the best practices".

"I like to put a chef and a shoemaker to work on the same problem. I think there is much more potential comparing that two shoemakers work together. However, the question is, whether the shoemaker understands if someone tries to explain of how to gut the fish" (Male, IDBM 1998).

All the interviewees considered that it is more valuable to mix disciplines than to try to smooth the differences caused by diversity of knowledge. People from distinct fields of businesses working together was considered to be the best practice to start innovation work. However, the widely spread disciplines of the team members were not considered to be the only seed for great innovations but more important were again the communication skills, as well as general team working skills. One interviewee stated that creating a successful innovation, "the team chemistry" is much more important than having team members whose disciplines are notable far from each other's. The same interviewee continued that team chemistry is even more important than the professional skills and knowledge of the team members.

The interviewees were also asked if the disciplines of a cross-functional team member can be too far from each other's. The general opinion stated that it might cause problems if the team members' fields are very widely spread. For instance, one interviewee considered that too widely

spread disciplines may cause situations where the disciplines does not complete or utilize each other's anymore, or that the risk of misunderstanding becomes too high. However, most of the interviewees considered that the issues caused by widely spread fields of the team members can be avoided if there is a project manager or another team member who act as a diplomat between the team members. The most important required skills of the diplomat were again communication and interpretation capability but also interdisciplinary competence. One interviewee specifically emphasized that the IDBM program can provide suitable competence to a person to be the connective link between the team members. She added, that if she needs to recruit someone, this is one of the reasons why an interdisciplinary education is a very valuable detail in a person's CV.

5.5.5. Creativity in Working Life

"Creativity comes from motivation" (Female, IDBM 2006).

As it was found from literature, also the interviewees considered that creativity is one of the most important resources of great innovations. The interviewees were asked how to stimulate or increase creativity in a cross-functional team. All the interviewees considered that motivation, a suitable environment as well as an open atmosphere influence mostly on the creativity of a team. Motivation, especially intrinsic motivation, was seen to be the single most increasing element of people's creativity, and higher motivation can result significantly to better innovations.

"Most of the people will produce less ideas, if they get a feeling that the ideas are disappearing to a black hole – continuous motivation is vital" (Male, IDBM 2005)

Two interviewees considered that monetary motivation might have positive effects. The first explained that he has tried to build a new kind of salary system, where the basic pay would be relatively low but if the person succeeds to create valuable innovations, then his or her earnings would increase substantially. This would force people to take more risks, if they want to have a higher salary; and that, on the other hand, might stimulate creativity. The other stated that monetary incentives might work for someone but not for everybody. One interviewee stated that monetary motivation does not increase creativity; at most money can make a person to throw more ideas but those ideas are hardly any more creative. Table 5 summarizes all the means, which the interviewees mentioned, that increases or decreases creativity.

Table 5. Means to increase or decrease creativity

Increase or Stimulate Creativity	Decrease or Constrain Creativity
High motivation	Low motivation
Monetary incentives:	The lack of long time strategy
- low basic salary	- managers only interested in short term profits
- high bonuses from successful innovations	- no resources
- willingness to take more risks	The lack of respect towards creative work
Creative people around you/mixed expertises	Culture where failures are feared
Culture where failures are accepted	Age
Innovation days	Complicated structures of the organization
Brainstorming methods	Systematic management of innovation work
- throwing ideas in a group	Must
Voluntariness	Complicated processes
Open atmosphere	Forced innovation sessions
Coffee table conversations	Boredom towards work or the working methods
Following trends outside the own business field	
Understanding of the markets	
A great team leader/manager	
- capable to utilize silence knowledge	
- capable to see the potential of a person	
Team spirit and chemistry	
Continuous process	
Trust and respect	

As it can be seen from the table, there are several of the same elements as what were found in the literature review (see Section 3.5.3). This substantiates the presumption that creativity can be stimulated, and creativity can have a tremendous impact on innovation work.

5.5.6. First in Market Due to Cross-Functional Development Process

"If you think about an engineer developer: he or she will stick with the technical details and patent issues, and forget the commercializing of the product. This has been a classical problem in Finland in the last decade" (Male, IDBM 1998).

All the interviewees believed that a cross-functional team has the potential to develop products faster to the markets compared to a homogenous team. Two of the interviewees had personal experience on that, and the two other agreed with the statement in theory. One of the interviewees stated that the potential can be destroyed if the structure of the team is too complicated. This can cause unnecessary politics and discussions in the team, which can further delay the development process. If the cross-functional team is composed correctly, in other words the team members truly believe that cross-functionality can provide extra value, the motivation of the team members is higher, and thus the effectiveness of the team is fundamentally improved. For instance, the business side of the team can increase positive pressure to the rest of the team, and to make them to create the product as quickly as possible to the markets to beat the competitors. The other interviewee explained that even though she does not have much experience in practice, she is sure that a cross-functional team can definitely develop products faster to the market. She justified this by saying that if cross-functional expertise is utilized already in the beginning of the development process, the possible limitations of the production

do not disturb the process later. For instance, if the material of the product sets certain limitations, it might speed up the process dramatically if the limitations are known at the beginning rather than at the end of the process.

"Crowdsourcing NPD process is like a cross-functional process to the power of three" (Male, IDBM 2005).

The third interviewee provided a very interesting point about the next steps of the NPD process. He agreed that a cross-functional team can expedite the development process greatly but he pointed out that this course of action can be further developed with crowdsourcing. The interviewee believes that by activating and inviting more people, in other words the users of the product, to the new product development process, an even better outcome can be achieved. In a crowdsourcing NPD process, at its best, the product can also be developed extremely fast due to the progressive and dynamic process.

5.5.7. The Creation Process of the Most Innovative Products

"I hate that kind of development processes where the only objective is to make profit a limited period next year" (Male, IDBM 2005).

The interviewees did not consider that there exists a single best practice to create the most innovative products, but they provided several methods of how to improve the creation process. First, the company should have a long term strategy. Two of the interviewees stated that if the goal is to create a new product focusing only on next year's markets, it is very unlikely that the product is a groundbreaking innovation. Companies should rather examine possible trends for which they could base their businesses on after 10-15 years. The other interviewee continued this by saying that there is only a certain limit for market or customer research that should be conducted and the best innovations are developed when a person or a team visualizes their own image of the future. Another suggested practice to create revolutionary innovations was the ability to establish already invented products to a completely new field. Three interviewees stated that sometimes traditional innovation work is not needed but an open mind towards other fields and trends can be enough. It was also emphasized that a person with an interdisciplinary background has often competence to execute this.

In addition to the above mentioned practices to create the most innovative products, the interviewees also mentioned:

- brainstorming as much as possible and then further develop the ideas
- open-mindedness
- capability to recruit a winning team
- motivating
- open organization model
- skills and expertise from distinct fields
- global team

"If some of the team members are working in other countries, a model should be developed, in which these people have a feeling that they are part of the team" (Male, IDBM 2005).

The interviewees were also asked what the influence of the environment on the innovation result is and how important the natural meeting places, such as cafeterias, are. All the interviewees considered that the environment can fundamentally influence on innovation results, but some of them also added that it is individual. One interviewee stated that it is often enough if people have a feeling that they can influence the working environment even though they would not change their current working environment be it possible. The physical environment was emphasized to be very important especially from team working perspective. In organizations there should be places, such as cafeterias, where natural meetings among team members and especially among other teams occur. As it can be seen, this is exactly the same thought as in the theory of an optimal interdisciplinary education environment (see Figure 7). One interviewee added that in these un-official places there should be sources for inspiration, for instance all kinds of magazines. Another interviewee considered that the best ideas are developed in an un-official environment where the employees have the feeling that they are at the same level as the managers, for instance in work place health promotion day.

6. CONCLUSIONS

The main research question of the thesis aims to answer whether the interdisciplinary education program in the university has had positive influence on the working career of the alumni. The supporting questions to facilitate the research were:

- Has the case program (IDBM) provided interdisciplinary competence for the students?
- Have the IDBM graduates implemented the interdisciplinary skills and knowledge learned from the program in their working life? If so, what has been the impact?
- What kind of significant differences can be found between all the business student graduates and IDBM business student graduates?

To answer the research questions and to fill the research gap a theoretical framework was constructed. The objective of the questionnaire was to investigate whether the findings in the theoretical model occur in reality or not. The in-depth interviews, on the other hand, examined why and how the phenomena of the theoretical framework occur. This chapter concludes the main findings from both of the empirical parts, and these conclusions answer the research questions thoroughly. In the beginning of the chapter the summary of conclusions is represented, which is followed by a deeper analysis about them. After that the theoretical implications, based on the findings, are represented. At the end of the chapter the limitations of the research, as well as suggestions for further studies are discussed.

6.1. Summary of Conclusions

In Figure 37 the most important empirical conclusions are applied to the simplified theoretical framework of the thesis. The figure summarizes the main conclusions and the outcome of the thesis.

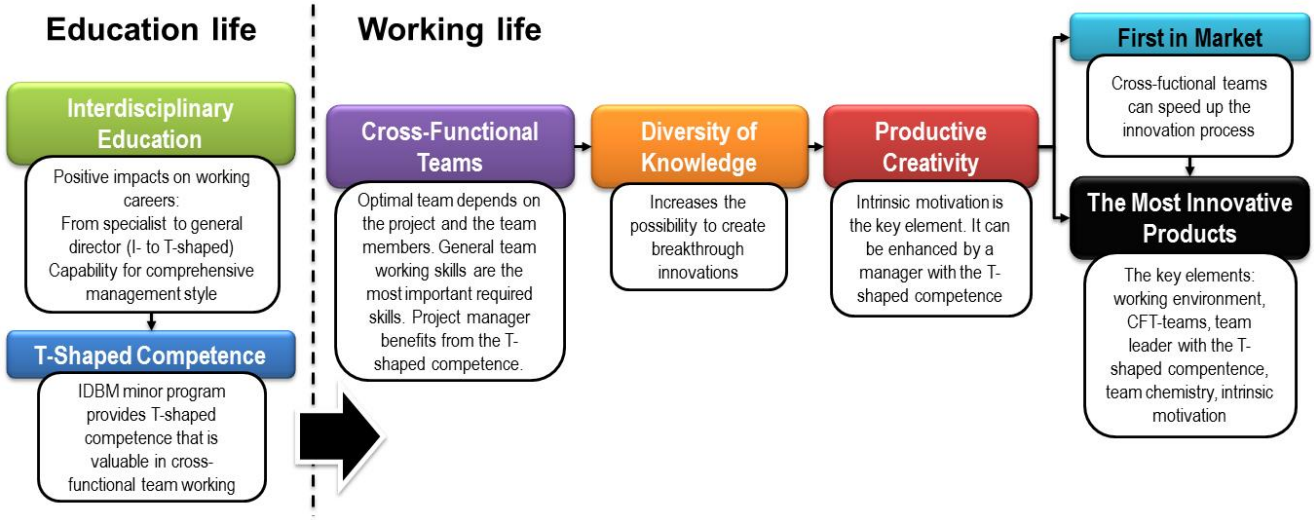

Figure 37. The simplified theoretical framework of the thesis completed with the most important empirical conclusions

According to the findings of the thesis, it can be concluded that the multidisciplinary IDBM minor program has had remarkable positive impact on most of the alumni's working careers. The program expands the graduates' skills and knowledge from the I-shaped competence to the direction of T-shaped competence, which is considered to be especially valuable in cross-functional team work. In their everyday tasks, the IDBM graduates have implemented the interdisciplinary skills and knowledge learned from the program, such as communication skills and interpretation knowledge of the issues. In addition, the IDBM program provides excellent prerequisites for a comprehensive management style as it improves the understanding of other expertise. However, despite being a management program, the empirical findings indicate that an IDBM graduate does not work in a management position relatively more often than a regular business student graduate. Hence, the potential of the program is not directly reflected in working careers.

In working life the benefits of interdisciplinarity can be seen especially in cross-functional team work. There is no best practice to build an optimal cross-functional team but it always depends on a project and on the individuals. However, according to the findings the team members' general team working skills are the most important required skills, no matter what kind of project is going on. In addition, a person with the T-shaped competence has an excellent basis to operate as a successful project manager in a cross-functional team.

According to the theoretical and empirical findings, it can also be concluded that the diversity of knowledge increases the possibility to create breakthrough innovations. However, in NPD processes the team members' diversity of knowledge does not guarantee that something novel will be innovated. The personal skills and motivations of the individuals are more important than the distant alignment of the team members' disciplines. However, the findings indicate that the cross-functional teams and the T-shaped competence can create significant extra monetary value to the businesses. A cross-functional team not only increases the possibility to create breakthrough innovations but it can also speed up the innovation process.

Creativity is the most important sources of successful innovations. Creativity can be enhanced by improving the intrinsic motivation of the individuals. A project manager with the T-shaped competence has the capability to improve intrinsic motivation of various kinds of individuals as he or she understands other disciplines or expertise comprehensively. In this sense the IDBM program, and especially the industry project, where creativity and motivation are two of the cornerstones for a successful outcome, prepares the students to work successfully in cross-functional teams.

This thesis indicates that the key elements of the most innovative products are creativity, an appropriate working environment, cross-functional team work, a team leader with the T-shaped competence, team chemistry and intrinsic motivation of the team members.

6.2. Educational Background

According to the empirical findings the business student graduates who have completed the multidisciplinary IDBM minor program understand the value of interdisciplinarity, and thus they have also actively exploited the knowledge they learned from the program in their working life. The IDBM program provides an excellent interdisciplinary environment, for instance by enhancing the chances to naturally meet people from different backgrounds. In addition, the education of the program is considered to be very motivating and high-quality; and the contents of the program are seen to meet the demands of a rich multidisciplinary program. Especially the industry project of the program is considered to be very advantageous by preparing the students to tackle the challenges in working life's projects.

In university studies the major study program typically provides expertise in a single field, in other words it forms the vertical bar of the T-shaped competence. As for the minor program often provides somewhat superficial expertise in another discipline but does not necessarily forms the horizontal bar of the T-shaped competence due to focusing only on single discipline. The IDBM minor program, on the other hand, integrates and combines other disciplines and enable students to understand how the single field interacts with other disciplines, and thus provides a more comprehensive T-shaped competence to its students. This is considered to be very valuable in the real business environment and thus the degree with the IDBM minor program brings also significant extra value to the graduates' CV. However, it cannot be said that the combination of disciplines in the IDBM program is the optimal and all-encompassing mix of disciplines. The program provides a particular T-shaped competence, which can be very valuable in working life. However, there can be several other mixes of disciplines that are as valuable as the mix of the IDBM program.

The IDBM program provides interdisciplinary skills and teaches cross-functional practices of how to create significant extra value to a business; skills and practices such as multidisciplinary communication skills, team working skills, design thinking skills, rapid prototyping practices, brainstorming and multidisciplinary product design skills, visualization skills, problem solving practices and especially skills to work with people from different backgrounds. However, even though the IDBM program well prepares the students for the challenges of working life, the "extra competence" does not directly reflect to the salaries, as a regular business student graduate earns on averagely more than an IDBM graduate in the jobs five years after graduation.

6.3. Cross-functionality (Multidisciplinarity) in Working Life

General team working skills received the second highest scores among all the business student graduates and the highest scores among IDBM graduates in the question about the merits the university degree provided. All the in-depth interviews also emphasized that the general team working skills are the most important skills that are required from the employees in the current

working life. Hence, one of the current trends of the business world, the ability to work in a team, has been taken properly into account in the Finnish university business studies.

As the findings of the thesis indicate, the next step for even more effective team work is to implement cross-functionality into it. The additional value that the IDBM program provides relates especially to cross-functional (or multidisciplinary) team work. The program provides multiple skills to operate as a project manager in a cross-functional team. The interdisciplinary background of the project manager is considered to facilitate the connections and communication between the disciplines or functions. Thus, it is not a surprise that almost all the IDBM graduates have worked in a multidisciplinary (cross-functional team), during their working career. Additionally, as almost two out of three of the questionnaire respondents stated that the multidisciplinary teams have brought significant extra monetary value to the business, it can be concluded that the theoretical benefits of the cross-functional team working can be seen in working life as well.

The extra value of the cross-functionality relates mostly on the diversity of knowledge the distinct functions can provide. The objectives of the cross-functional project determine the suitable functions or disciplines that should be selected to the particular work. In general, if the team members' disciplines are widely spread, the possibility to create breakthrough innovations increases but it does not guarantee good results. Sometimes the disciplines can even be too far from each other's, which can result to negative synergy. On the other hand, if the team members' disciplines of are too close to each other, the innovations are rarely extraordinary breakthroughs. In the IDBM program, especially in the industry project, the students learn how to work in a team, where the disciplines are usually very far from each other's. In the projects, students are aiming to create novel and groundbreaking outcome (or innovations) by constantly searching for ways to utilize the diversity of knowledge as much as possible. Hence, in this sense it can be concluded that the IDBM graduates might be exceptionally qualified and prepared to create breakthrough innovations in working life as well.

In the current business world innovations are very important as innovation processes can not only develop organizations, but successful innovations also have the potential to improve a company's operational profit. Most of the IDBM graduates (over two out of three) have been involved in an innovation creation process during their working life, and most of them have also utilized the knowledge and skills they learned from the IDBM program in the innovation processes. The empirical findings of the thesis support the importance of innovation work as two out of three IDBM graduates consider that the innovation/s they have been involved in have caused significant positive monetary value to the business. Therefore, it can be concluded that there most likely exist some sort of a connection between the IDBM graduates and successful innovations in working life. To fully understand what kind of connection, the phenomenon should be investigated more precisely.

According to this research, the most important source of innovation is creativity. However, as discussed earlier, enhancing a person's creativity is a difficult and complex process. Creativity is

the cornerstone of innovation but above all, it is a mental process. Some general practices (see Table 5) of how to stimulate and enhance creativity were found in the empirical part but the most important core resource for better and more productive creativity is the intrinsic motivation. The IDBM minor program provides skills and practices to stimulate creativity, but also competence for its students to at some level enhance people's intrinsic motivation in working life. For instance, in a cross-functional team, a project manager with IDBM background can have a special competence to explain the objectives of the project from various perspectives, and thus to increase team members' intrinsic motivation. This can result to better innovations, and finally increase a business' profits.

Another concrete benefit of the interdisciplinarity in working life relates to the new product development process. If the NPD process is conducted by a cross-functional team, the possibility to produce the product faster than normally to markets increases. For instance, if the cross-functional expertise is utilized already in the beginning of the development process, the limitations of the production do not disturb the process later as they are discussed in the early stages. Crowdsourcing could be the next step for further developing of the cross-functional NPD process. By further activating and inviting more people to the NPD process the product can possibly be developed to the markets even faster than by simply with a cross-functional team.

As the empirical findings of this research showed by implementing interdisciplinarity in working life significant extra monetary value can be achieved especially through innovation work. For instance, a project manager with the T-shaped competence can fundamentally facilitate the innovation process in several ways, which makes the process more effective, and finally results to significant economic benefits. In general, interdisciplinary skills and the T-shaped competence with a comprehensive view is considered to be particularly valuable in everyday management duties and cross-functional team work. The T-shaped persons are considered often to be exalted easier to managers compared to I-shaped persons. However, it cannot be generalized that a person with T-shaped competence automatically succeeds in the business world, but the success depends always on an individual. It can be concluded that the T-shaped competence with interdisciplinary skills presumably increases the potential to succeed in working life, and that the IDBM is such a program where this suitable competence can be acquired.

6.4. The Difference between a Regular Business Student Graduate and an IDBM Business Student Graduate

One of the research questions aimed to answer what the differences between IDBM graduates and all the business student graduates are. From the empirical findings some notable differences were found and they are summarized in this section. As the differences were discussed in more detail in the previous chapter, only an average person of the target and control group is introduced here; in other words a typical business student graduate with and without an IDBM minor program. The characteristics of the average IDBM alumnus base on the questionnaire

results, whereas the characteristics of the regular business student base on the reference studies by SEFE and FSD.

6.4.1. The Gender and the Education

The following figures summarize the averagely differences of the two groups.

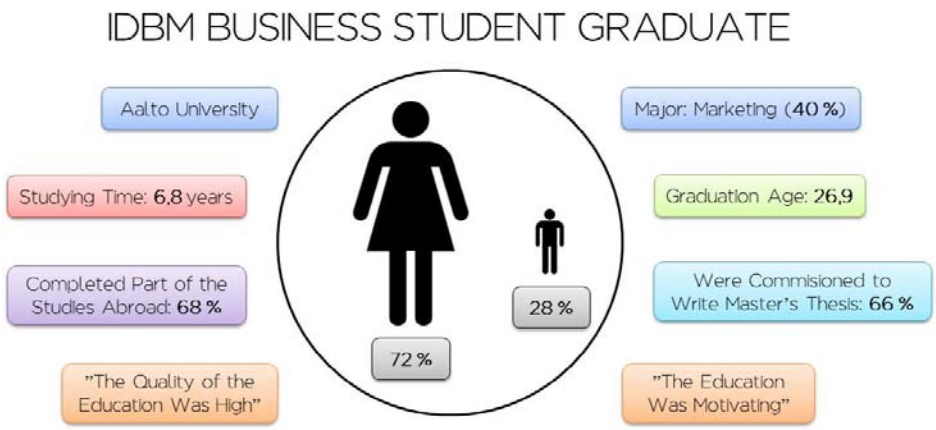

Figure 38. An average IDBM business student graduate

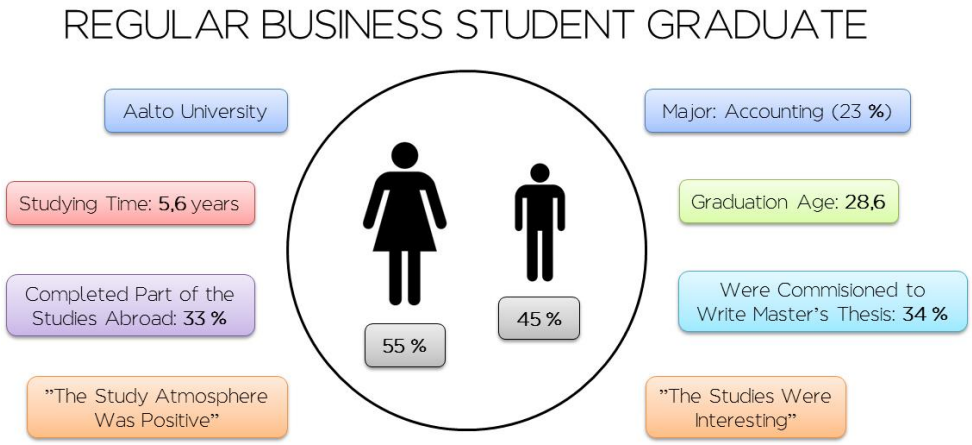

Figure 39. An average regular business student graduate

In addition to the differences mentioned in the figures, some differences were also found in the attitude towards entrepreneurship. The IDBM graduates stated that the program confirmed their trust on entrepreneurship. This can be seen in the next section's figures as well, entrepreneurship has been more common among the IDBM business student graduates than among all the business student graduates.

6.4.2. The First Job and the Job Five Years after Graduation

Figure 40 and Figure 41 summarize the differences between the two groups in their first job, whereas Figure 42 and Figure 43 summarize the differences between the two groups in their jobs five years after graduation.

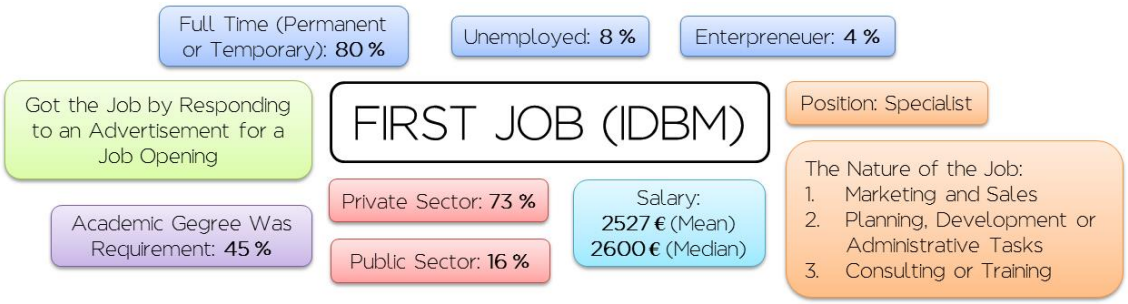

Figure 40. The IDBM alumni's work situation right after graduation

Figure 41. All the business student alumni's work situation right after graduation

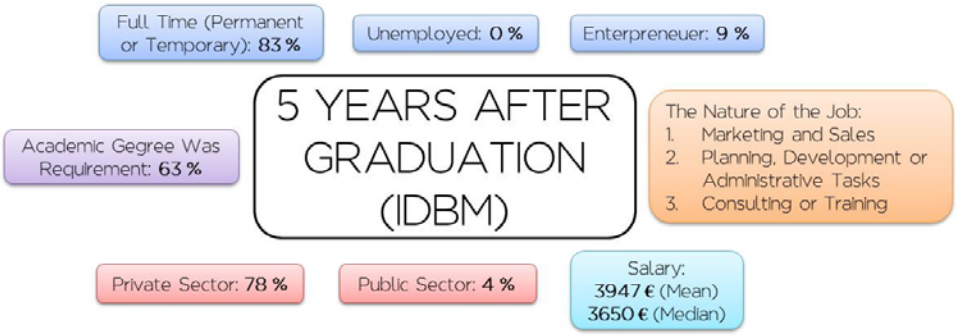

Figure 42. The IDBM alumni's work situation five years after graduation

Figure 43. All the business student alumni's work situation five years after graduation

6.5. Limitations of the Research

During the research it became evident that some limitations that are difficult to remove exist. One restriction relates to the memory. The long time perspective may affect the accuracy of memory, which can cause errors in the answers (Granovetter 1995). The first IDBM program was in 1995, which means that some of the respondents might have had difficulties to remember what happened many years ago. This might have influenced the answering accuracy.

Another limitation relates to the risk of misunderstanding. As the questionnaire was constructed by following the two reference studies, the questions were mostly decided in advance. This forced the respondents to understand the questions as they were stated in the questionnaire, thus it was impossible to ask amplified questions. However, because the questionnaire was similar to all respondents, this risk can be considered to be minimal.

Even though the respondents of the target group and the control group were from almost the same period, there were still some differences that may affect the results. For instance, the graduation year may have a tremendous influence on a graduate's employment possibilities. Employment is typically much easier in the middle of the economic boom than in the middle of recession. Therefore, to have a more accurate comparison of results, the distribution of different graduation years between the target and the control group should be explored.

Case studies also always set some limitations to the research. The generalization of the results has to be done carefully and it should be emphasized that the results are based only on a single case. However, as this is typically in case studies, the limitations are not remarkable.

Some limitations exist also in the in-depth interviews with the IDBM alumni. First, the interviewees were selected from the program and they represent only four people's opinions on the case program. The conclusions based on these opinions could be different with four other IDBM alumni. In addition, the amount of in-depth interviewees was relatively low, which causes a single opinion to have a great effect on the final results. However, these limitations are naturally part of qualitative research. If more valid and all-encompassing information is wanted, the research should be repeated with more respondents and in other interdisciplinary programs. Secondly, as the interviews were conducted by telephone, the body language and the non-verbal reactions were impossible to notice. In addition, sometimes the interviewees answered the questions relatively quickly without probably thinking deeply of the answers. Therefore, the opinions of the interviewees are based likely on their first reaction rather than on deep consideration.

6.6. Suggestions for Further Studies

Extensive empirical data of the research would enable several distinct further studies. In this thesis the quantitative analysis was conducted by using relatively simple methods, which also set some limitations to the generalizations. Hence, more credible statistical findings could be gained

by conducting distinct kinds of cross-analysis, as well as examining significant levels more precisely.

Because interdisciplinarity as a concept is vast, the research question about, if the interdisciplinary education has had positive influence on working career, could be divided into smaller and more detailed questions. For instance, it could be explored more precisely, what the monetary positive influence of the interdisciplinarity has been on what kind of projects. This kind of research would further justify the importance of interdisciplinary education.

In addition, to gain a deeper understanding from the case program, the research could be executed among all the IDBM alumni, not only among IDBM business student alumni. This would provide a deeper understanding of what is the influence on the major and the minor program, and if there are remarkable differences between business, engineers and design students. The research could also investigate another interdisciplinary program in another university.

6.7. Managerial Implications

According to this research, the benefits of interdisciplinary competence in working life are undeniable. Hence, the most important managerial implication suggests that interdisciplinary programs should be increased and cherished in the current educational institutions. The capability to integrate, combine and mix disciplines can create valuable competence for students to succeed in working life, and in big picture this can have positive effects on the nation's economy.

By examining the particular case program in more detail, some managerial implications can also be suggested. First, the internationality should be constantly emphasized in the program. It has developed during the history of the program, but in the current global business environment internationality is more important than ever. The program can be considered to be more international compared to the regular business degree, as for instance the IDBM alumni are doing a part of their studies abroad twice as often as all the business student alumni. However, not all the IDBM alumni were satisfied with the amount of internationality. Especially the level of internationality in industry projects varied greatly among the IDBM alumni, which makes the program unequal for its students. Hence, the internationality should be integrated to be an important part of the program's future strategy.

As discussed earlier, the program does not produce more managers compared to a regular business degree, even though IDBM aims to be a management program. Hence, the management contents could be emphasized more in the program because the program has the potential to provide excellent management skills, especially for cross-functional team working.

Lastly, at the moment the reputation of the program is high, especially among the alumni. However, the program is not well-known in the business world. Therefore the recognition of the program should also be somehow enhanced, for instance by increasing the marketing of the IDBM program. IDBM has huge potential; the potential just has to be redeemed.

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Alumni Survey

A. Basic Information

1. Gender *

Female Male

2. Year of birth *

3. Please name all the universities you have graduated from? *

- Aalto University/Helsinki School of Economics
- Other, please specify
- Other, please specify
- Other, please specify

4. Please name all the degrees (master's or higher) you have completed? *

- Master of Science (Economics)
- Other, please specify
- Other, please specify
- Other, please specify

5. Starting year of the university degree in which you did IDBM *

6. Starting year of the IDBM Program *

7. Major/study program *

- Accounting
- Business law
- Business communication
- Creative sustainability
- Economics
- Entrepreneurship
- Finance
- Information and service management
- International business
- Logistics
- Management
- Marketing
- Strategy
- Something else, please specify

8. Did you completed other minor program besides IDBM? *

No Yes

9. Did you complete part of the studies abroad (e.g. in student exchange)? *

No Yes

10. Were you commissioned to write your thesis? *

Did you receive some sort of compensation, e.g. monthly salary, research grant.

No Yes

11. Date of graduation (in which you did IDBM) *

Year

Month

12. Have you participated in any education after you completed the degree in which you did IDBM? *

No Yes

B. Working Career

Situation right after graduation/first job

The following questions (13 - 24) concern your first job after you completed the degree in which you did IDBM. You may have started the job before you graduated

13. What was your work situation right after graduation? *

- I had a permanent full-time job
- I had a permanent part-time job
- I had a temporary or fixed-period full-time job
- I had a temporary or fixed-period part-time job
- I was a full-time entrepreneur
- I was a part-time entrepreneur/commercial undertaker/company shareholder
- I was continuing my studies
- I was on parental or child care leave
- I was doing my military or non-military service
- I was unemployed
- Other. Please specify

14. If you were not employed at the time of graduation, how many months did it take before you started in your first job after graduation?

15. How did you get your job? Pick 1 or 2 most important. *

- I responded to an advertisement for a job opening
- The Internet (e.g. the company Web site)
- Through the university's/academic unit's career services
- Through a head hunter/recruitment service
- Through the Public Employment Office
- Through 'Ekonomipörssi'
- Through personal contacts
- I worked at the same organization during my studies
- I wrote my thesis for the employer
- Through the university/academic unit/a professor
- I was offered a job
- I contacted employers on my own initiative
- I am working for my own company
- In another way, please specify

16. Who was your first principal employer? *

- Private enterprise or a government-owned corporation, at least 250 employees.
- Private enterprise or a government-owned corporation, 50-249 employees.
- Private enterprise or a government-owned corporation, less than 50 employees.
- Municipality, federation of municipalities, municipal enterprise
- Polytechnic/university of applied sciences

- Government, unincorporated government enterprise
- University
- Association, congregation, foundation, or similar; institution or community governed by public law
- Personal enterprise, practice, or business name etc.
- Something else, please specify

17. What was the name of the company and where did your first job mainly locate?

Name

City and Country

18. What was your position in the organization? *

- Top level management (president/executive vice-president, chief executive officer)
- Middle level management (marketing director, personnel director, director of finance)
- Upper first level management (departmental manager)
- Lower first level management (office manager)
- Specialist (also a planner or project manager for example)
- Independent entrepreneur
- Professor/lecturer/teaching assistant/other teacher
- Office or civil service employee, not in all executive position
- Other. Please specify

19. Which of the following alternatives best describes the nature of your work in your first principal job? *

You may select more than one alternative

- [ ] Research
- [ ] Education or teaching
- [ ] Leadership or management duties
- [ ] Consulting or training
- [ ] Customer service / patient work
- [ ] Marketing and sales
- [ ] Planning, development, or administrative tasks
- [ ] Communications and media
- [ ] Office work
- [ ] Artistic work
- [ ] Legal work
- [ ] Religious work
- [ ] Financing and economic management
- [ ] Something else, please specify

20. Which of the alternatives above best describes your main duties/tasks? *

Please select only one alternative

- Research
- Education or teaching
- Leadership or management duties
- Consulting or training
- Customer service / patient work
- Marketing and sales
- Planning, development, or administrative tasks
- Communications and media
- Office work
- Artistic work
- Legal work
- Religious work
- Financing and economic management
- Something else, please specify

21. What was your occupational title or job title in your first job? *

22. Your gross salary (including fringe benefits) in your first job after graduation (€/month)? *

23. Was the higher (lower) academic degree you completed a requirement for your first job? *

-

24. How well were you able to put the skills you learned during your university studies into practice in your first job? *

-

B. Working Career (continues)

Five years after graduation

The following questions (25 - 41) concern your job **five** years after you completed the degree in which you did IDBM.

If there is less than five years since you graduated, please evaluate your current job/situation.

25. What was your work situation five years after graduation? *

If there is less than five years since you graduated, please consider your current situation.

- I had a permanent full-time job
- I had a permanent part-time job
- I had a temporary or fixed-period full-time job.
- I had a temporary or fixed-period part-time job
- I was a full-time entrepreneur
- I was a part-time entrepreneur/commercial undertaker/company shareholder
- I was continuing my studies
- I was on parental or child care leave
- I was doing my military or non-military service
- I was unemployed
- Other. Please specify

26. Who was your principal employer five years after graduation? *

If there is less than five years since you graduated, please consider your current employer.

- Private enterprise or a government-owned corporation, at least 250 employees.
- Private enterprise or a government-owned corporation, 50-249 employees.
- Private enterprise or a government-owned corporation, less than 50 employees.
- Municipality, federation of municipalities, municipal enterprise
- Polytechnic/university of applied sciences
- Government, unincorporated government enterprise
- University
- Association, congregation, foundation, or similar; institution or community governed by public law
- Personal enterprise, practice, or business name etc.
- Something else, please specify

27. What was the name of the company and where did your job five years after graduation mainly locate?

If there is less than five years since you graduated, please consider your current job.

Name

City and Country

28. What was your position in the organization five years after graduation? *

If there is less than five years since you graduated, please consider your current job.

- Top level management (president/executive vice-president, chief executive officer)
- Middle level management (marketing director, personnel director, director of finance)
- Upper first level management (departmental manager)
- Lower first level management (office manager)
- Specialist (also a planner or project manager for example)
- Independent entrepreneur
- Professor/lecturer/teaching assistant/other teacher
- Office or civil service employee, not in all executive position
- Other. Please specify

29. Which of the following alternatives best describes the nature of your work five years after graduation? *

If there is less than five years since you graduated, please consider the nature of your current work.

You may select more than one alternative

- ☐ Research
- ☐ Education or teaching
- ☐ Leadership or management duties
- ☐ Consulting or training
- ☐ Customer service / patient work
- ☐ Marketing and sales
- ☐ Planning, development, or administrative tasks
- ☐ Communications and media
- ☐ Office work
- ☐ Artistic work
- ☐ Legal work
- ☐ Religious work
- ☐ Financing and economic management
- ☐ Something else, please specify

30. Which of the alternatives above best describes your main duties/tasks? *

If there is less than five years since you graduated, please consider the main duties/tasks in your current job.

Please select only one alternative

- ○ Research
- ○ Education or teaching
- ○ Leadership or management duties
- ○ Consulting or training
- ○ Customer service / patient work
- ○ Marketing and sales
- ○ Planning, development, or administrative tasks
- ○ Communications and media
- ○ Office work
- ○ Artistic work
- ○ Legal work
- ○ Religious work
- ○ Financing and economic management
- ○ Something else, please specify

31. What was your occupational title or job title in your job five years after graduation? *

If there is less than five years since you graduated, please consider your current job.

32. Your gross salary (including fringe benefits) in your job five years after graduation (€/month)? *

If there is less than five years since you graduated, please consider the gross salary of your current job.

33. Was the higher (lower) academic degree you completed a requirement for your job five years after graduation? *

If there is less than five years since you graduated, please consider your current job.

-

34. How well were you able to put the skills you learned during your university studies into practice in your job five years after graduation? *

If there is less than five years since you graduated, please consider your current job.

-

35. How long were you employed in the first five years after graduation? *

If there is less than five years since you graduated, please consider the time between the graduation and present.

Years

Months

36. If you were unemployed in the first five years after graduation, how many times and how many months totally? *

If there is less than five years since you graduated, please consider the time between the graduation and present.

Times

Months

37. How many employers did you have in the first five years after graduation? *

If there is less than five years since you graduated, please consider the time between the graduation and present.

-

38. How many employment / public service employment relationships did you have in the first five years after graduation (consider each fixed-term employment as a separate employment relationship)? *

If there is less than five years since you graduated, please consider the time between the graduation and present.

-

39. Have you worked as an independent entrepreneur / self-employed person / freelancer during the five years after graduation? *

If there is less than five years since you graduated, please consider the time between the graduation and present.

○ No ○ Yes

40. Is an entrepreneur career an option for you in general? *

○ No ○ Yes ○ Don't know

41. Have you ever worked in a multidisciplinary team during your working career? *

○ No ○ Yes ○ Don't know

C. Contribution of IDBM Program

Assessment of the university studies and IDBM Program

42. Assess the whole university degree in which you did IDBM. Please rate the merits your education gave you in terms of how well it prepared you for working life.

Use a scale of **1 to 5** (passable - fair - satisfactory - good - excellent).

	1	2	3	4	5
General knowledge of economics *	○	○	○	○	○
Ability in your major subject / study program *	○	○	○	○	○
Ability in your minor subject / minor studies *	○	○	○	○	○
Communication skills in other languages *	○	○	○	○	○
Scientific ability *	○	○	○	○	○
Entrepreneurial skills, intellectual *	○	○	○	○	○
Entrepreneurial skills, attitudinal *	○	○	○	○	○
Ability to work internationally *	○	○	○	○	○
Team-working skills *	○	○	○	○	○
General leadership skills *	○	○	○	○	○
Skills in human resources / management *	○	○	○	○	○
Data processing skills *	○	○	○	○	○
Ability to learn new things *	○	○	○	○	○
Ability to solve problems *	○	○	○	○	○
Ability to perform in public *	○	○	○	○	○
Ability to interact *	○	○	○	○	○
Negotiation skills *	○	○	○	○	○
Project management skills *	○	○	○	○	○
Work life knowledge *	○	○	○	○	○
Prerequisites for acting ethically *	○	○	○	○	○
Multidisciplinary working skills *	○	○	○	○	○

	1	2	3	4	0
Something else, please specify					

43. Assess the IDBM Program.This part concerns only the IDBM Program (the courses and the industry project that you did in part of the program). *

Rate the following statements on a scale from **1 to 4** (1 = does not describe my attitude at all, 2 = describes my attitude quite poorly, 3 = describes my attitude quite well, 4 = totally describes my attitude, **0 = unable to answer**).

	1	2	3	4	0
The quality of the education was high					
The education was demanding					
The education was motivating					
The amount of courses satisfied					
The variety of courses satisfied					
The industry project was useful for me					
The TKK courses supported my learning					
The HSE courses supported my learning					
The Taik courses supported my learning					
The studies were interesting					
The education gave me good skills for work/professional life					
The education was international					
The study atmosphere was positive					
The teaching methods were appropriate					
The courses supported the industry project					
The industry project fullfilled my expectations					
The industry project was useful for the case company					
The presence of a real company provided extra value					
The workload was appropriate					
The final result of the industry project was successful					
The industry project supported my learning					
The program showed the benefits of multidisciplinarity					
The program improved my personal skills to be more creative					
The program improved my business management skills					
The program improved my multidisciplinary communication skills					

C. Contribution of IDBM Program (continues)

Contribution of IDBM Program to your working life

This part concerns the (extra) value that IDBM Program has possibly offered to your working life. Please recall your whole working career and IDBM Program. Assess if the knowledge and the skills that you learned from the program have had contribution to your working life.

44. You have utilized the knowledge you learned in IDBM in business management during your working career? *

No Yes Don't know

45. The knowledge you learned in IDBM have brought significant extra monetary value to the business you have been involved in? *

No Yes Don't know

46. The knowledge you learned in IDBM have brought other significant extra value to the business you have been involved in? *

No Yes, please specify Don't know

47. You have been involved in a creation process of multidisciplinary working teams? *

No Yes Don't know

48. The multidisciplinary team brought significant extra monetary value to the business?

No Yes Don't know

49. You have been involved in an innovation creation process? *

No Yes Don't know

50. You have utilized the knowledge you learned in IDBM in an innovation creation process?

No Yes Don't know

51. If you answered Yes (question 49. and 50.), did the innovation/s brought significant monetary value to the business?

No Yes Don't know

52. You have applied working methods you learned in IDBM during your working life? *

No Yes, please give (an) example/s

53. The practices you learned in IDBM have helped to create significant extra monetary value to the businesses you have been involved in? *

No Yes Don't know

54. You learned practices in the IDBM Program how to create other significant extra values to the businesses you have been involved in. *

No Yes, please give (an) example/s Don't know

The reputation of IDBM Program

55. Evaluate the general reputation of IDBM. *

Rate the following statements on a scale from **1 to 4** (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree, **0 = unable to answer**)

	1	2	3	4	0
IDBM is well known in your current company					
IDBM is well known in the field you work in					
IDBM is well known in business world generally					
The recognition of IDBM has continuously increased					
The quality of the IDBM's reputation is high					
IDBM brings extra value to your CV					
You have spread a positive word of IDBM during your working career					
IDBM has helped to create new career opportunities					

56. Have you been in contact with your IDBM student friends in a professional context during your working career? *

No Yes

57. Would you recommend IDBM to a friend? *

No Yes

58. If you answered No, please specify

59. Are you interested in participating in interview? *

In addition to this questionnaire, few deep interviews are conducted to gain better understanding of IDBM's influence on innovation and business management.

No Yes, please give your e-mail

60. Do you have a message to the IDBM Program?

61. Free word?

Thank you very much for the answers!

APPENDIX 2: The Covering Letter and the Remainder Message

Poikkitieteellisen koulutusohjelman vaikutus – case IDBM

Kerään aineistoa IDBM-ohjelman käyneistä kauppatieteilijöistä. Tavoitteenani on saada kokonaiskuva ohjelman käyneistä alumneista, heidän työuristaan sekä mahdollisesta IDBM:n vaikutuksesta.

Kirjoitan pro gradu -tutkielman Aalto yliopiston Helsingin Kauppakorkeakoulun IDBM-ohjelmalle. Aineisto luovutetaan IDBM-osaston käyttöön. Kyselyyn vastaaminen vie reilu 10 minuuttia. Vastaukset käsitellään luottamuksellisesti, eikä yksittäistä vastaajaa ole mahdollista tunnistaa vastauksista. Kyselyn lopussa kuitenkin halukkaat voivat jättää sähköpostiosoitteen mahdollista jatkohaastattelua varten.

Jotta tutkimuksesta tulisi luotettava, on mahdollisimman korkea vastausprosentti erittäin tärkeää. Kysely on toteutettu englanniksi sillä myös IDBM-ohjelman kieli on englanti. Mikäli kyselyssä on jotain epäselvää, minuun voi olla yhteydessä joko sähköpostilla tai puhelimitse.

Lähetän tutkimusraportin kaikille halukkaille kyselyyn vastanneille. Vastaa kyselyyn osoitteessa (11.12.2013 mennessä):

https://www.webropolsurveys.com/S/4C713D93829DD979.par

Kiitos paljon ajastasi! Lähetyspäivämäärä 3.12.2013
Pekka Sihvola
040-5793722

The impact of multidisciplinary education program – case IDBM

I'm collecting data about IDBM business school alumni. The purpose is to gain overall picture of the alumni, their working career and the impact of IDBM program.

I'm writing my master's thesis for Aalto University, School of Business, IDBM Faculty. The data will be given to IDBM faculty. It takes about 10 minutes to answer the questionnaire. All the answers are handled in confidence and an individual respondent is impossible to identify. In the end of the questionnaire, the respondent can provide his or her e-mail address for possible further interviews.

It is very important to get as many answers as possible to gain reliable data. The questionnaire is in English due to IDBM program is also in English. If there is something unclear in the questionnaire, please don't hesitate to contact me.

I will send the research report to everyone who is interested in it. Please, answer the questionnaire (by 11.12.2013):

https://www.webropolsurveys.com/S/4C713D93829DD979.par

Thank you for your time! Sending date 28.11.2013
Pekka Sihvola
040-5793722

Muistutusviesti 16.12.2013

Poikkitieteellisen koulutusohjelman vaikutus – case IDBM
Kiitos kaikille kyselyyn vastanneille!
Mikäli et ole vielä vastannut kyselyyn, voit täyttää lomakkeen osoitteessa:
https://www.webropolsurveys.com/S/4C713D93829DD979.par
Jotta tutkimuksesta tulisi luotettava, on mahdollisimman korkea vastausprosentti erittäin tärkeää.

Kiitos paljon,
Pekka Sihvola
040 5793722

Reminder message 16.12.2013

The impact of multidisciplinary education program – case IDBM
Thank you for all the respondents.
If you haven't yet filled the questionnaire, please answer in:
https://www.webropolsurveys.com/S/4C713D93829DD979.par
It is very important to get as many answers as possible to gain reliable data.

Thank you,
Pekka Sihvola
040 5793722

APPENDIX 3: Details of the In-Depth Interviewees

Table 6. The details of the in-depth interviewees

Gender	Female	Male	Male	Female
Year of Birth	1970	1973	1981	1983
Starting Year of the University Degree	1992	1993	2001	2005
Starting Year of the IDBM Program	1995	1998	2005	2006
Graduation Year	1999	2008	2007	2008
Major/Study Program	Marketing	Marketing	International Business	Business Communication

APPENDIX 4: Supporting Questions for the In-Depth Interviews

Interdisciplinary Education:

- How did the IDBM Program made you understand the value of interdisciplinarity?
- Why the IDBM program offered a suitable interdisciplinary environment?
- Why the IDBM degree is valuable?

T-Shaped Competence:

- Did the IDBM provide T-shaped competence?
- How the IDBM program provided abilities across other disciplines?
    - For instance skills to integrate, combine, mix, joint disciplines
- Why do you think the T-shaped competence is valuable?

Cross-functional Teams:

- Why cross-functional teams are important or valuable in working life?
- How the advantages of interdisciplinarity emerge in cross-functional teams?
- How the multidisciplinary teams have brought significant extra monetary value to the business?
- How to build a successful cross-functional team?

Diversity of Knowledge:

- How heterogeneity impact on the created knowledge of the team?
- How the result of the team (innovation) differs when the team members' alignment of the disciplines varies?
- How to find the balance between the alignment of the disciplines and the expected value of the innovation?

Productive Creativity:

- How have you utilized the knowledge you learned in IDBM in an innovation creation process?
- How the innovations brought significant monetary value to the business?
- Why and how the diversity of the knowledge effect on innovations?
- How to stimulate creativity?
- Motivation one source of creativity – agree or not?
    - How the motivation can be enhanced?

First in Market:

- How is it possible to be first in the market?
- Why cross-functional teams can create products faster to markets?
- Cross-functional teams – informational diversity – faster to markets?
- How interdisciplinarity/cross-functional teams can create competitive advantage?

The Most Innovative Products:

- How to create the most innovative products?
- How work environment influences on creativity?
- What is the primary source of innovations?
- What kind of source is creativity for innovations?
- How the practices you learned in IDBM have helped to create significant extra monetary value to the businesses you have been involved in?

General questions:

- How have you utilized the knowledge you learned in IDBM in business management during your working career?
- How the knowledge you learned in IDBM have brought extra monetary value to the business you have been involved in?
- How have you applied working methods you learned in IDBM during your working life?
- Did the IDBM program influenced on your attitude towards entrepreneurship?
- How do you see the difference between the I- and T-shaped competences?
    - How does this effect on career?

Weaknesses of the IDBM program/how would you improve the program?

APPENDIX 5: The Questionnaire Data

General Information

Respondents	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**	**Mean**
Graduates	182	1376	1397	1554	1589	3398		1758	1822	3793	1175	1630	1668	2018	23178	1782,9
Respondents	103	941	928	832	945	2240		1075	1081	2476	817	987	1004	1504	14830	1140,8
Responding %	56,6	68,4	66,4	53,5	59,5	65,9	65,9	61,1	59,3	65,3	69,5	60,6	60,7	74,5	64,0	63,9
HSE, graduates		349	320	360	378	730		346	391	1002	207	261	313	390	5047	388
HSE, respondents		259	189	127	222	659		304	305	868	197	246	286	384	4046	311
HSE, responding %		74,2	59,1	35,3	58,7	90,3	90,3	87,9	78,0	86,6	95,2	94,3	91,4	98,5	80,2	80,0
Gender	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**	**Mean**
Female %	71,8	54,0	52,0	56,0	56,0	56,0	56,0	54,0	55,0	52,0	57,0	55,0	55,0	54,0	54,5	54,8
Male %	28,2	46,0	47,0	44,0	44,0	44,0	44,0	46,0	45,0	48,0	43,0	45,0	45,0	46,0	45,5	45,2
Female	74	508	483	995		1254		581	595	1288	466	543	552	812	8076	621
Male	29	433	436	782		986		495	486	1188	351	444	452	692	6745	519
HSE, female %		59	64	59	59	50	50	50	49	50	54	53	51	41	52	53,0
HSE, male %		41	57	41	41	50	50	50	51	50	44	47	49	59	49	48,5
HSE, female		153	121	75	131	330		152	149	434	106	130	146	157	2085	160,4
HSE, male		106	108	52	91	330		152	156	434	87	116	140	227	1997	153,6
Major	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		**Mean**
Marketing %	40,2	19	18	15	17	17	17	16	15	14	14	16	14	15		15,9
International business %	33,6	10	9	8	10	7	7	6	6	4	8	9	5	7		7,4
Marketing, HSE, %		*Not available*				15	15	17	17	14	11	15	17	12		14,8
International business, HSE, %						8	8	9	7	6	19	10	14	13		10,4
Accounting %		30	29	29	24	23		25	26	20	22	17	20	15		23,3
Marketing, Female %		58	66	70		67		69	70	64	69	71	63	63		66,4
Marketing, Male %		42	34	30		33		31	30	36	31	29	37	37		33,6
International business, Female %		68	56	65		64		72	67	63	62	66	60	64		64,3
International business, Male %		32	44	35		36		28	33	37	38	34	40	36		35,7
2011, average: Kv. Liiketoiminta and International Business																
Minor	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		**Mean**
Organization & Management		*Not available*		24		25		24	22	20	23	15	19	16		20,9
Business Law				35		30		32	34	30	26	12	15	15		25,4
Accounting				28		26		27	28	28	30	21	19	14		24,6
Graduation Age	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		**Mean**
Mean, years	26,86	27,3	28,7	28,3	28	*Not available*		28,4	28,6	29,6	28,8	28,9	28,8	29		28,6
Standard deviation	2,64															
HSE		26,6	28,7	27,8	27,7			28,1	28,7	29,8	27,8	27,3	27,9	27,9		28,0
Studying Time	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		**Mean**
Mean, years	6,8	5,4	5,6	5,2	5,4	5,5		5,4	5,4	**6,71**						5,58
Standard deviation	2,31									*the degree reform in 2008*						
Studying Abroad	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		**Mean**
Yes, %	68	28	31	33		35	35	36	35	34	42	30	30	30		33,25
No, %	32	72	69	67		65	65	64	65	66	58	70	70	70		66,75
HSE, yes %		38	39	42		43	43	45	38	39			32	31		39
HSE, no %		62	61	58		57	57	55	62	61			68	69		61
Thesis Commission	**IDBM**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**		**Mean**
Yes, %	66	*Not available*							42	33	35	34	33	27		34,0
No, %	34								58	67	65	66	67	73		66,0
HSE, yes %									46	37	34	36	43	37		38,8
HSE, no %									54	63	66	64	57	63		61,2

First Job after Graduation

What was your work situation right after graduation?	IDBM	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
I had a permanent full-time job	49,5	59,0		41,0		40,0		48,0	54,0	55,0	43,0	48,0	49,0	51,0	48,8
I had a temporary or fixed-period full-time job	30,1	18,0		27,0		24,0		20,0	19,0	16,0	21,0	18,0	17,0	15,0	19,5
Part-time job (permanent/temporary)	1,9	3,0		5,0		6,0		4,0	5,0	6,0	6,0	7,0	9,0	10,0	6,1
I was a full-time entrepreneur	2,9	1,0		0,8		2,0		2,0	1,0	3,0	2,0	2,0	1,0	2,0	1,7
I was a part-time entrepreneur/commercial undertaker/company shareholder	1,0								1,0	1,0	1,0	1,0	1,0	1,0	1,0
I was continuing my studies	2,9	3,0		4,0		4,0		3,0	1,0	2,0	3,0	3,0	2,0	1,0	2,6
I was on parental or child care leave/I was doing my military or non-military service	2,0	1,0		1,0		2,0		2,0	2,0	2,0	2,0	3,0	4,0	5,0	2,4
I was unemployed	7,8	9,0		15,0		17,0		14,0	15,0	12,0	21,0	16,0	15,0	13,0	14,7

Who was your first principal employer?	IDBM	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Private sector	72,8	78		72		72		76	80	79	77	76	76,3
Public sector	15,5	16		20		20		16	13	13	18	17	16,6
Association, foundation	3,9	1		3		2		2	2	1	2	3	2,0
Enterpreneur	5,8								2	4	3	3	3,0
Something else	1,9	4		4		6		6	3	3	1	2	3,6

What was your position in the organization?	IDBM	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Management	8,7	11,0		12		10		13	16	21	19	15	14,6
Specialist (also a planner or project manager for example	65,0	51		41		39		42	46	43	44	46	44,0
Office or civil service employee, not in all executive posi	3,9	27		33		32		29	24	25	27	27	28,0
Professor/lecturer/teaching assistant/other teacher	7,8			5		6		5	3	3	3	2	3,9
Independent entrepreneur	3,9			1		3		2	1	1	2	1	1,6
Other. Please specify	10,7			5		5		5	7	5	7	7	5,9

How did you get the job?	IDBM	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
I responded to an advertisement for a job opening	19,1	17,0		12,2		11,0		9,2	11,0	10,0	6,2	7,1	7,2	5,8	9,7
The Internet (e.g. the company Web site)	5,9	10,0		11,2		12,0		18,4	16,0	16,0	15,5	16,2	20,8	22,3	15,8
Through the university's/academic unit's career services	3,7			0,0				0,0	8,0	7,0	6,2	7,1	4,0	5,8	4,8
Through a head hunter/recruitment service	0,7	9,0		7,1		7,0		9,2	5,0	4,0	3,1	4,0	4,0	3,3	5,6
Through the Public Employment Office	0,7	1,0		1,0		2,0		1,0	1,0	1,0	0,8	1,0	1,6	1,7	1,2
Through 'Ekonomipörssi'	0,7	0,0		0,0		0,0		0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Through personal contacts	14,0	10,0		11,2		11,0		12,2	12,0	14,0	13,2	12,1	13,6	11,6	12,1
I worked at the same organization during my studies	16,2	18,0		22,4		23,0		22,4	19,0	19,0	23,3	23,2	20,0	21,5	21,2
I wrote my thesis for the employer	11,0	8,0		8,2		5,0		3,1	3,0	3,0	5,4	6,1	4,8	5,0	5,1
Through the university/academic unit/a professor	4,4	3,0		4,1		3,0		3,1	3,0	1,0	2,3	2,0	1,6	2,5	2,6
I was offered a job	4,4	7,0		7,1		7,0		6,1	8,0	9,0	8,5	8,1	8,8	7,4	7,7
I contacted employers on my own initiative	9,6	9,0		8,2		8,0		6,1	7,0	7,0	8,5	8,1	8,0	7,4	7,7
I am working for my own company	3,7	2,0		1,0		4,0		3,1	2,0	4,0	3,1	2,0	1,6	2,5	2,5
In another way, please specify	5,9	4,0		4,1		3,0		3,1	2,0	2,0	3,9	3,0	4,0	3,3	3,2
Don't know/no answer		2,0		2,0		4,0		3,1	3,0	3,0					2,9

Was the higher (lower) academic degree you completed a requirement for your first job?	IDBM	2001	2002-2003	2005	2007	Mean
Yes	44,7	55	45	48	*Not available*	49,3
No	39,8	34	44	41		39,7
Don't Know	15,5	11	11	11		11,0

Which of the alternatives above best describes your main duties/tasks?	IDBM	2001	2002-2003	2005	2007	Mean
Research	11,9	7	7	9	4	6,8
Education or teaching	4,5	4	4	4	3	3,8
Leadership or management duties	1,7	5	6	9	7	6,8
Consulting or training	14,8	12	8	12	11	10,8
Customer service / patient work	0,6	4	5	11	4	6,0
Marketing and sales	22,2	15	14	12	15	14,0
Planning, development, or administrative tasks	15,9	23	14	11	13	15,3
Communications and media	14,8	2	1	2	1	1,5
Office work	6,3	16	8	6	10	10,0
Artistic work	1,7	0			0	0,0
Legal work	0,6	1	2	2	2	1,8
Religious work	0,0				0	0,0
Financing and economic management	1,1		25	19	26	23,3
Something else, please specify	4,0	11	6	3	4	6,0

How well were you able to put the skills you learned during your university studies into practice in your first job?	IDBM	2001	2002-2003	2005	2007	Mean
I wasn't able to make use of them almost at all	6,8	7	12	13	8	10,0
I made use of them to some degree / partially	67,0	51	50	52	55	52,0
I made use of them constantly	26,2	42	38	35	37	38,0

Your gross salary (including fringe benefits) in your first job after graduation (€/month)?	IDBM	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Mean	2527	2294	2367	2371		2490		2720	2847	3135	2910	3028	2685
Median	2600	2186	2291	2354		2350	2410				2800	2900	2470
Standard deviation	672,9	*Not available*						1457	1159	1866	1258	1108	

Five Years after Graduation

What was your work situation five years after graduation?	IDBM	2001	2002-2003	2005	2007	Mean
Full-time job (permanent or temporary)	78,6	81	84	81	83	82,3
Part-time job (permanent or temporary)	1,0	1	1	1,5	1	1,1
Entrepreneuer	6,8	3	3	3	4	3,3
Continuing studies	3,9	1	1	0,5	1	0,9
I was on parental or child care leave	3,9	11	9	11	9	10,0
I was unemployed	0,0	1	1	1,8	1	1,2
Other. Please specify	1,0	1	1	0,7	1	0,9

Who was your principal employer five years after graduation?	IDBM	2001	2002-2003	2005	2007	Mean
Private company	77,7	78	76	76	80	77,4
Government, unincorporated government enterprise	0,0	10	11	5	6	8,0
Municipality, federation of municipalities, municipal enterprise	0,0	5	7	6	5	5,8
Personal enterprise, practice, or business name etc.	5,8	4	2	3	3	3,0
Association, congregation, foundation, or similar; institution or communi	2,9	3	4	4	3	3,5
University	10,7	0	0	6	3	2,3
Something else, please specify	2,9	0	0	0	0	0,0

Was the higher (lower) academic degree you completed a requirement for your job five years after graduation?	IDBM	2001	2002-2003	2005	2007	Mean
No	26,2	19	20	22	*Not available*	20,3
Yes	63,1	73	71	69		71,0
Don't know	10,7	8	9	9		8,7

Which of the alternatives above best describes your main duties/tasks?	IDBM	2001	2002-2003	2005	2007	Mean
Research	8,7	3	6	7	3	4,8
Education or teaching	1,0	2	3	3	3	2,8
Leadership or management duties	7,8	24	17	27	15,5	20,9
Consulting or training	13,6	12	9	12	10,5	10,9
Customer service / patient work	1,0	1	1	4	2	2,0
Marketing and sales	27,2	14	14	10	13,5	12,9
Planning, development, or administrative tasks	17,5	20	14	11	16	15,3
Communications and media	7,8	2	1	2	2	1,8
Office work	0,0	9	2	2	3,5	4,1
Artistic work	1,9	0	0	0	0	0,0
Legal work	0,0	2	2	2	2	2,0
Religious work	0,0	0	0	0	0	0,0
Financing and economic management	2,9		26	17	25	22,7
Something else, please specify	10,7	11	5	3	4	5,8

How well were you able to put the skills you learned during your university studies into practice in your job five years after graduation?	IDBM	2001	2002-2003	2005	2007	Mean
I wasn't able to make use of them almost at all	2,9	2	3	3	4	3,0
I made use of them to some degree / partially	57,3	42	41	45	45	43,3
I made use of them constantly	39,8	56	56	52	51	53,8

Your gross salary (including fringe benefits) in your job five years after graduation (€/month)?	IDBM (n=76)	2001	2002	2003	2005	2007	Mean
Mean	3947	3997	4146		4517	4619	4427
Median	3650	3700	3600	3931	4060	4200	3948

Assess the whole university degree in which you did IDBM. Please rate the merits your education gave you in terms of how well it prepared you for working life.	IDBM	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
General knowledge of economics	3,70	8,1	8,1	8,0	8,0		8,1		8,1	8,0	8,0	8,0	8,0	3,7	3,6	8,0
Ability in your major subject / study program	3,71	8,4	8,4	8,4	8,3		8,4		8,3	8,4	8,3	8,4	8,4	4,0	3,9	8,4
Ability in your minor subject / minor studies	3,74	7,9	7,9	7,8	7,8		7,9		7,8	7,8	7,8	7,9	7,9	3,5	3,5	7,9
Communication skills in other languages	3,93	7,9	8,0	7,9	7,9		8,0		8,0	8,1	8,1	8,1	8,2	3,8	3,7	8,0
Scientific ability	3,51	7,7	7,8	7,8	7,8		7,8		7,9	7,8	7,8	8,0	8,1	3,7	3,7	7,9
Entrepreneurial skills, intellectual	2,83	6,7	6,7	6,7	6,8		6,9		6,8	7,1	7,1	7,2	7,2	2,9	2,9	6,9
Entrepreneurial skills, attitudinal, *since 2007*	2,76									7,2	7,2	7,3	7,3	3,1	3,1	7,3
Ability to work internationally	4,21		8,0	7,9	8,0		8,0		8,1	8,2	8,3	8,4	8,4	4,0	4,0	8,1
Team-working skills	4,34	8,3	8,5	8,4	8,4		8,6		8,5	8,7	8,6	8,9	8,8	4,3	4,2	8,6
General leadership skills	3,30	7,5	7,6	7,5	7,5		7,6		7,6	7,8	7,8	7,9	7,9	3,5	3,5	7,7
Skills in human resources / management, *since 2004*	3,03						7,5		7,5	7,6	7,7	7,7	7,7	3,4	3,3	7,6
Data processing skills	3,26	7,9	7,9	7,8	7,9		7,9		7,9	7,9	7,9	7,9	8,0	3,6	3,5	7,9
Ability to learn new things	4,30	8,7	8,8	8,7	8,7		8,8		8,7	8,8	8,7	8,8	8,9	4,3	4,3	8,8
Ability to solve problems	4,24	8,4	8,5	8,4	8,4		8,5		8,5	8,6	8,5	8,6	8,6	4,1	4,1	8,5
Ability to perform in public, *since 2007*	3,80									8,2	8,2	8,3	8,3	3,9	3,8	8,3
Ability to interact, *since 2007*	4,03									8,4	8,3	8,4	8,5	4,0	4,0	8,4
Negotiation skills, *since 2011*	3,02													3,5	3,5	
Project management skills, *since 2011*	3,50													3,6	3,6	
Work life knowledge, *since 2011*	3,00													3,3	3,3	
Prerequisites for acting ethically, *since 2011*	2,98													3,5	3,5	
Something else, please specify	4,10															

Assess the IDBM Program.This part concerns only the IDBM Program (the courses and the industry project that you did in part of the program)	IDBM	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean
The quality of the education was high	3,48	2,9	2,9	3,0	3,0		3,0		3,0	3,1	3,1	3,2	3,2	3,3	3,3	3,11
The education was demanding	2,93	2,7	2,7	2,8	2,7		2,7		2,8	2,9	2,9	3,0	3,0	3,1	3,2	2,88
The education was motivating	3,56	2,7	2,7	2,8	2,8		2,8		2,8	3,0	2,9	3,0	3,0	3,2	3,1	2,95
The studies were interesting	3,38										3,2	3,3	3,3	3,4	3,4	3,33
The education gave me good skills for work/professional life	3,08	2,8	2,9	2,8	2,8		2,8		2,8	3,0	3,0	3,0	3,0	3,1	3,1	2,94
The study atmosphere was positive	3,43	3,3	3,3	3,3	3,3		3,3		3,3	3,4	3,4	3,4	3,4	3,5	3,5	3,37

Have you participated in any education after you completed the degree in which you did IDBM?	IDBM	2001	2002-2003	2005	2007	Mean
Yes	42,7	82	81	77	68	77,0
No	57,3	18	19	23	32	23,0

Have you been unemployed (incl. layoffs) after graduation?	IDBM	2001	2002-2003	2005	2007	Mean
Yes	33,8	18	25	25	25	23,3
No	66,2	82	75	75	75	76,8
Once	76,9	75	73	73	75	74

Contribution of IDBM Program

Assess the whole university degree in which you did IDBM. Please rate the merits your education gave you in terms of how well it prepared you for working life. *Use a scale of 1 to 5 (passable – fair – satisfactory – good – excellent)*	**1**	**2**	**3**	**4**	**5**	**Mean**
General knowledge of economics	0	6	29	58	10	3,70
Ability in your major subject / study program	0	6	29	57	11	3,71
Ability in your minor subject / minor studies	0	6	28	56	13	3,74
Communication skills in other languages	0	5	21	53	24	3,93
Scientific ability	1	8	43	39	12	3,51
Entrepreneurial skills, intellectual	9	29	41	19	5	2,83
Entrepreneurial skills, attitudinal	13	36	25	21	8	2,76
Ability to work internationally	0	4	11	47	41	4,21
Team-working skills	0	1	10	45	47	4,34
General leadership skills	2	19	36	38	8	3,30
Skills in human resources / management	5	21	47	26	4	3,03
Data processing skills	1	16	46	35	5	3,26
Ability to learn new things	0	1	7	55	40	4,30
Ability to solve problems	0	1	10	55	37	4,24
Ability to perform in public	1	4	27	54	17	3,80
Ability to interact	0	2	16	62	23	4,03
Negotiation skills	6	24	39	30	4	3,02
Project management skills	1	12	37	41	12	3,50
Work life knowledge	7	19	47	27	3	3,00
Prerequisites for acting ethically	7	26	38	26	6	2,98
Multidisciplinary working skills	2	3	13	50	35	4,10
Something else, please specify	23	4	24	9	23	3,06

Assess the IDBM Program.This part concerns only the IDBM Program (the courses and the industry project that you did in part of the program). *Rate the following statements on a scale from 1 to 4 (1 = does not describe my attitude at all, 2 = describes my attitude quite poorly, 3 = describes my attitude quite well, 4 = totally describes my attitude, 0 = unable to answer)*	**1**	**2**	**3**	**4**	**0**	**Mean**
The quality of the education was high	0	5	40	57	1	3,48
The education was demanding	3	21	51	26	2	2,93
The education was motivating	0	4	25	71	3	3,56
The amount of courses satisfied	1	13	45	39	5	3,09
The variety of courses satisfied	1	7	41	49	5	3,24
The industry project was useful for me	8	15	13	60	7	3,08
The TKK courses supported my learning	3	12	34	46	8	3,04
The HSE courses supported my learning	1	9	38	40	15	2,84
The Taik courses supported my learning	0	13	33	52	5	3,23
The studies were interesting	0	5	18	71	9	3,38
The education gave me good skills for work/professional life	2	10	41	43	7	3,08
The education was international	0	8	37	49	9	3,14
The study atmosphere was positive	0	1	13	78	11	3,43
The teaching methods were appropriate	0	3	46	46	8	3,18
The courses supported the industry project	9	28	37	27	2	2,76
The industry project fullfilled my expectations	8	16	32	42	5	2,95
The industry project was useful for the case company	6	15	35	38	9	2,84
The presence of a real company provided extra value	1	4	17	68	13	3,22
The workload was appropriate	0	2	35	60	6	3,39
The final result of the industry project was successful	2	12	39	42	8	3,02
The industry project supported my learning	2	12	29	55	5	3,23
The program showed the benefits of multidisciplinarity	1	4	18	70	10	3,33
The program improved my personal skills to be more creative	1	8	16	70	8	3,35
The program improved my business management skills	4	11	39	45	4	3,14
The program improved my multidisciplinary communication skills	1	2	19	73	8	3,44

In persons (n=103)	**You have utilized the knowledge you learned in IDBM in business management during your working career?**	**The knowledge you learned in IDBM have brought significant extra monetary value to the business you have been involved in?**	**The knowledge you learned in IDBM have brought other significant extra value to the business you have been involved in?**	**You have been involved in a creation process of multidisciplinary working teams?**
No	9	46	32	22
Yes	83	31	42	79
Don't know	11	26	29	2

The knowledge you learned in IDBM have brought other significant extra value to the business you have been involved in? Specify?	
Ability to build winning team	one competitive edge in the market
ability to enter a new market	one of the core benefits
ability to work successfully with artists and engineers	personal relationships
awareness of possibilities	Product development
changing the organisational culture to more innovative	Product development process skills
contacts	Research methods
contacts & a title to use in	resource savings
design and brand management	service design of public services
efficiency - IDBM helps to build project teams differently and facilitate in team forming.	special knowledge
Graphic design capability improved	symbolic value, appreciation
I work for design industry	The ability to communicate effectively with people from different academic backgrounds
Knowing my worth	The job indirectly
Much more of a cross-cultural multi-disciplinary perspective.	The people I got to meet have remained good friends and connections throughout the rest of my career
multidisciplinarity	through deeper brand management analytical skills
multidisciplinary communication and negotiation skills	through teaching
Multi-disciplinary team leadership skills	understanding of multidisciplinary work
Multidisciplinary working methods	understanding the ways to work in a multidisciplinary team has increased the work effiency
Multidiscplinary team work skills	usable data, also from abroad
My position as an interpreter between consultants and creative people as well as technical people brought improvements in work satisfaction in latter groups	working in multidisciplinary teams
networks	Working with designers and products

In persons (n=103)	**The multidisciplinary team brought significant extra monetary value to the business?**	**You have been involved in an innovation creation process?**	**You have utilized the knowledge you learned in IDBM in an innovation creation process?**	**If you answered Yes (question 49. and 50.), did the innovation/s brought significant monetary value to the business?**
No	24	32	37	18
Yes	52	68	53	32
Don't know	26	3	10	25

You have applied working methods you learned in IDBM during your working life? Example(s)?	
Assessing client needs	innovation processes
brainstorming	international work, teamwork
Brainstorming and design processes	I've worked with a similar case as the company of the industry project
brainstorming methods	leading game development
brainstorming sessions, quick&dirty, illustrations	more creative processes, managing and communicating to people outside my discipline
brainstorming with team, creative approaches	Multidisciplinary research
brainstorming, keeping interviews, project management	multidisciplinary team work
bringing people together from different areas and facilitating the team forming (this helps in any project and bridges the gap between different divisions e.g. IT and marketing)	multidisciplinary teamwork
broad spectrum of design/user-driven design methodologies + service design methodologies + concept design	Not only the result matters, but the path also.
cross disiplinary teams in innovation processes and e.g. in evaluation for innovative business plans	Observation
deisgn work	process mapping, brainstorming
design management, service design management, innovation mgt	Product design process
Every day in product development	Product designing process
experience in understanding the value of different educational backgrounds in general	project management tools
Finding tie-ins between art/design and society/behavior.	prototyping, piloting, working in multidisciplinary teams...
For research purposes: research methods, analysis	service and product develpoment, design management
Forming more multi-disciplinary approach to our work and operations.	service design, creative team work skills
general team working skills	Team work methods in multidisciplinary projects
I build up interdisciplinary teams as part of my job and manage the process and communication to all stakeholders.	Team working
I do new business development 100% of my work time, I used to be responsible for Innovation management in my company of over 1.000 employees in my previous position.	teamwork, multidisciplinary teams, presentational skills, etc.
I have done design business management consulting as an enterpreneur during my maternity leave.	teamworking skills
I have given creativity workshops in which the studies in TAIK have helped	Understanding the design and design management process
I switched from marketing research to user experience and interaction design 7 years after graduation	Understanding the importance of design in what ever we do
idea generation, bringing new approaches, questioning old ways	working in a team, "patience" with people from different backgrounds
ideation, prototyping, scenarios...	working in multidisciplinary teams
innovation and creative teamwork methods	Yes, especially in teamwork/communication

In persons (n=103)	**The practices you learned in IDBM have helped to create significant extra monetary value to the businesses you have been involved in?**	**You learned practices in the IDBM Program how to create other significant extra values to the businesses you have been involved in.**	**You have applied working methods you learned in IDBM during your working life?**	
No	40	39	41	
Yes	25	29	62	
Don't know	38	35		

You learned practices in the IDBM Program how to create other significant extra values to the businesses you have been involved in. Example(s)?	
Better user experiences	intrapreneurial practices, creativity, better processes
communication, communication, communication	leading game development
customer experience, customer satisfaction etc.	multidisciplinary team work
design thinking	multiple views
Developing personas and user scenarios	new business develpoment
different faculties had different approach for problem solving or strategy creation - these tools have enriched my own methods of problem solving. Learning the designers view or engineers approach helps me everyday in finding the best solution for a business problem. Multidisciplinary teams are not too homogenous and allows different type of creativity for problem solving. Doing a real life project in a multidisciplinary team is an real life exercise which benefits any company from efficiency point of you - people's mind sets are ready for normal business life.	New perspectives
do it first and apologize later	Rapid prototyping, the attitude to of lean start-up
IDBM studies and industry project made me realize how valuable bringing the right people for projects is and taught about creative work methods, as well as about accepting more risk. I think most important value adding factor from my job's perspective has been learning design thinking approach and means to apply it in different contexts. I asked to study in TaiK courses outside IDBM courses, so I was able to focus on the things I was most motivated.	service modelling, usability
idea generation, bringing new approaches, questioning old ways	Team building
innovation mgt	understanding of digitalization
integrated design, visualization of concepts	visualizations in communications
interactions with customers abroad	

Evaluate the general reputation of IDBM. *Rate the following statements on a scale from 1 to 4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree, 0 = unable to answer)*	**1**	**2**	**3**	**4**	**0**	**Mean**
IDBM is well known in your current company	26	31	12	23	11	2,10
IDBM is well known in the field you work in	26	34	17	18	8	2,11
IDBM is well known in business world generally	19	42	26	3	13	1,87
The recognition of IDBM has continuously increased	3	14	40	21	25	2,28
The quality of the IDBM's reputation is high	2	3	43	35	19	2,72
IDBM brings extra value to your CV	3	7	34	50	9	3,10
You have spread a positive word of IDBM during your working career	2	2	33	61	5	3,39
IDBM has helped to create new career opportunities	8	20	27	37	11	2,69

In persons (n=103)	**Have you been in contact with your IDBM student friends in a professional context during your working career?**	**Would you recommend IDBM to a friend?**	**Are you interested in participating in interview?**	
No	49	4	64	
Yes	54	99	39	