The Desirable Collaboration

Challenges and possibilities for university-industry collaboration in IT educations

Lovisa Westerdahl
Abstract

Collaboration between university and industry has traditionally been absent due to organizational diversities, motives and operations. This has changed as the academy has become more involved in the industry and vice versa, also known as a shift from mode 1 to mode 2. University-Industry collaboration has shown to be effective for innovation and value creation and is becoming even more important because of increasing competition and globalization, especially in the field of IT. However, there is a gap in current research as it has only looked at university-industry collaboration in terms of research projects and not at an educational program level. The industry of IT is currently facing difficulties of finding new recruitment and the educational programs of IT want to offer students an up to date high quality IT education. Although there is mutual interest for collaboration there are still challenges to overcome in order to establish a sustainable collaboration between the university and industry of IT. This study aims to explore the possibilities and challenges for university-industry collaboration in IT educations. In exploring this research question, this study applies the trading zone framework with the aim to explore how university-industry collaboration can sustain over time. This study has been carried out as a qualitative case study in northern Sweden. The results show that collaboration between educational programs of IT and IT industry has possibilities for knowledge-exchange, capacity building, recruitment planning and the ability to apply knowledge. However, the results also show aroused challenges in collaboration, such as time management, individual dependence and the affects of contextual factors.
1. Introduction

Traditionally, the university has been disconnected with the outside business world, as the missions of the university have not attached to the needs of economical and social development of the business world. For the university, the primary object has traditionally been the progression of knowledge in terms of research, rather than progression of the world where research can be applied (Harloe & Perry, 2004). This boundary has become more blurred, as the current economy, also known as the knowledge economy, is build upon a flow of information rather than materials (Kellogg, 2006). Currently, collaboration between the university and the business world is seen as crucial in order to create innovations for establishing a sustainable knowledge economy (Etzkowitz, 2005).

This shift from non-collaboration to collaboration can be understood as a shift from mode 1 towards mode 2 (Harloe & Perry, 2004). The new knowledge production, as in mode 2, is based on the university engaging in the surrounding regional agencies for improving national competitiveness. Mode 2 can be understood by the triple helix-model (Etzkowitz, 2005; vinnova.se) where the academy, industry and government are interlaced in collaboration for creating value and innovation. The consequence of this kind of interlace is that innovation is not solely taking place and being utilized within the business world, it also pays back to the university in terms of research projects, competence improvement, and the business world get new resources for innovation (Etzkowitz, 2005). The triple helix model, as in mode 2, can also resemble a value constellation, where companies, suppliers and customers get more connected and co-create value and innovation, as opposed to the traditional value chain, where the different actors were more distant from each other (Vargo & Lush: 2004; Normann & Ramirez: 2000).

Existing research on university and industry collaboration have mainly focused on collaboration in terms of research projects (Etzkowitz, 2005; Collins, 2007; Kellogg, 2006; Harloe & Perry, 2004) rather than collaboration in educations. As there are advantages in university-industry collaborations for research projects and innovations, there are potentially advantages for educational collaborations as well, for example businesses getting a wider base for new recruitment and universities teaching applied knowledge.

Even though there is an interest in university-industry collaboration at an educational level, the urge for collaboration is not fuss-free. The university and the business world have different organizational structures and different needs, which can be an explanation to why it is difficult to create a sustainable collaboration (Seashore & Anderson, 1998). While both parts can gain benefits from collaboration, there are still challenges to overcome in terms of differences in norms and interests. The challenge is therefore to defeat the differences between the academy as a traditional bureaucratic organization and a more flexible and flat organizations that modern IT companies enact (Kellogg, 2006). These issues raise the question of how to overcome the organizational boundaries and to establish a long-term collaboration between the IT-industry and the educational programs of IT.

In the field of IT, there is a mutual interest from university and IT industry to collaborate on an educational level (Woodward, et. al. 2010). From the business world’s point of view, there is a growing need for new employee recruitment of students who have graduated from the university. In similarity, from an academic point of view, the interest is having strong and
current research where the contacts with the business world are crucial. The university also desires quality in the educational programs to prepare students for what awaits them in the labor force of IT, which also is a stressed issue from the business world (Woodward, et. al. 2010; Chen, 2006).

The collaboration between industry and university can be compared with a trading zone (Collins, 2007), where the two parties have different values that they can exchange. Collaboration between the university and industry, as in mode 2, is based on a trade of knowledge for strengthen the perspective on the own organization. However, because of differences in organizational structures, both parts will have to modify their knowledge in order to transform it to each other (Kellogg, 2006; Harloe & Perry, 2004). This transformation can be assisted by a trading zone, which can constitute a common system that can bridge the differences by transforming knowledge and make it more effective in creating a jointly knowledge (Kellogg, 2006). The idea of a trading zone can therefore constitute the bridge between the two parts and work as a common contact area for collaboration (Collins, 2007).

Against this backdrop the research objective of this paper is to explore the possibilities and challenges for university-industry collaboration in IT educations. In exploring the possibilities and challenges, this study applies the trading zone framework with the objective to explore how university-industry collaboration can be mediated to sustain over time.

Further, this study employed a qualitative case study to explore university-industry collaborations within IT educations. Within the IT industry the focus is more specifically on IT-vendor companies, which are likely to be the future employers of the students in the educational programs of IT. The theory of trading zone will be applied for understanding the gap between university and industry and how to create a sustainable collaboration.

This paper proceeds as follows: Chapter two gives a view on the frame for this study as in related research on university-industry collaboration and a presentation of the theory of a trading zone and why it is relevant for this study. Chapter three describes the method used for this study and a presentation of the context of the study. Chapter three also describes the data collection and gives a presentation of the informants of this study. In the following part, chapter four gives perspectives on what motives and contributions from both the university’s and IT industry’s perspectives. It also speaks about what challenges both parts face and what requirements they have for collaboration. Chapter five presents the current work of collaboration between the surrounding business life and Umeå University and what contributions and challenges of that operation. Chapter six contains the discussion of this paper and finally, chapter seven presents the conclusions.

2. Related Research

2.1 Industry-Academy Collaboration

Transformations in the academy have traditionally been slow when driven from within as changes have been viewed as fearful, especially when outside forces are the impellers (Etzkowitz & Webster, 1998). Traditionally, the university has established values and norms that are consistent within the own organization, without having to take competing value systems into consideration. However, because of the industrial involvement in the university,
these traditional values are going through changes, mainly because of the globalization of the economy, which has changed the nature of competition and processes. This made the industry pushing the state, as in the university, to devote resources for increasing innovation so nations can compete more successfully (Anderson, 2001; Etzkowitz, Seashore Louis & Anderson 1998).

These changes can be understood in terms of a shift from separation of the university towards integration with the surrounding business world (Etzkowitz, 2005). This shift is known as a shift from mode 1 to mode 2 where the underlying force of this development is the knowledge economy. In mode 1, knowledge is produced within a specific disciplinary context where the research problem is defined, resolved and controlled by the disciplinary context. The knowledge economy demands faster and more effective innovation, which has made knowledge valuable. The industry needs the academy to translate this knowledge and making it applicable, which became one reason for the shift from mode 1 to mode 2 (Etzkowitz, 2005). In this way, the controlled disciplinary context of mode 1, has in mode 2 become a more transparent production of knowledge to be transmitted to a context of application, which means that the knowledge can be applied (Harloe & Perry, 2004). The model of triple helix (Etzkowitz, 2005) can illustrate mode 2 where university, industry and state work in collaboration for innovation. In this way the university becomes an entrepreneur, who is the base and the condition for having a sustainable knowledge economy, as the knowledge produced in the university can be applied in the business world (Etzkowitz, 2005). The authors argue that in the triple helix model, innovation is not created in a traditional linear way. Instead, the three actors collaborate in constant processes which is not solely about flow of knowledge, but also taking on different roles, where the university take on the role as the entrepreneur and the industry share knowledge and can take on a role as an educator (Etzkowitz, 2005).

The triple helix model has shifted the relations between university and industry from sponsorship to partnership, which opens up for a deeper relation with a long-term focus. Because of the transparency in mode 2, the university can reach outside its own boundaries and connect to the industry and government differently than what was possible in mode 1. This way of collaboration is not only improving the knowledge economy, but also changing the social form of organization that is useful for creating networks and collaborations across organizational boundaries (Harloe & Perry, 2004; Dooley & Kirk, 2007). Being involved in collaboration with the industry, the university can also generate spillovers in terms of teaching, employment opportunities for students and future consulting opportunities (Anderson, 2001).

Because knowledge production is expensive and sometimes hard to attain, collaboration between the university and industry has become a way to circumvent the issue of producing valuable knowledge, and by that contribute to social and economic growth. In the complex contemporary innovation system, cross-organizational collaboration is necessary for coping with these demands. Here the university has become a key contributor to the economic development that provides human capital as a seedbed for new firms and innovations (Dooley & Kirk, 2007; Etzkowitz, 2005).
However, the cultural differences between the university and industry, as differences in values and time frames, can explain the issues for planning and establishing collaboration (Seashore & Anderson, 1998; Dooley & Kirk, 2007). The differences in structure and culture illustrates the different driving forces of the university and industry, where the university has an interest in publishing papers and increasing research funds, while the industry has interests in commercialization rather than published information. Concerning this issue, how to balance the needs of the university and the need of the industry is therefore one of the biggest challenges in university-industry collaboration (Anderson, 2001; Dooley & Kirk, 2007). Another problem with establishing a sustainable collaboration is the dependence on specific individual contacts between university and industry. If these driving spirits drop off, the collaboration will most likely disappear. One of the challenges is therefore to create long-term collaboration that deviate from depending on individuals.

Commercialization is another issue concerning university-industry collaboration. In mode 1, the university was more departed from the rest of the society while in mode 2 it has an intimate interaction with the business world. This has made the university more commercialized than before, and therefore a challenge in balancing the university as a public authority working with private-owned companies. The risk is that the competing pressure of the business world might hit the university, as the university is an important repository of independency (Anderson, 2001). Another issue that could come with the competing pressure is questions concerning patents, which could be an issue using spillovers in teaching, as a collaboration-project might need secrecy. The main challenge in university-industry collaborations is therefore to maintain the balance between two parts with different interests (Anderson, 2001; Etzkowitz, 2005). One possible way of balancing the different interests could be the idea of a trading zone.

2.2 Trading Zone

The theory of a trading zone has its origin in a place where two different groups with inconsistencies, but with mutual interests in trade can meet, trade and communicate. In a trading zone, the two groups can share some activities while they depart on others (Galison, 1999). The specific about a trading zone is even though the two groups are different; they can still collaborate in terms of coming to consensus on the procedure of exchange. Although there is a common understanding of the procedure for exchange, the outcome of exchange can have a different meaning to the different group. For e.g. trading money for food can have a higher meaning of survival for one group than the other (Galison, 1999).

The challenge, in order to establish a trading zone, is for the trading partners to decide on a local coordination to overcome incommensurability (Collins, et al. 2007). A trading zone in this case is a place where communication can be facilitated in order to enable trade between two parts. If there were no problem with incommensurability there is just trade and no zone is necessary. In this way, a trading zone becomes a place where issues concerning communication and co-ordination can be understood and resolved (Collins, et al. 2007).

A trading zone can be a constellation in four different states and is movable between these states; inter-language, enforced trading zones, subversive trading zones and fractionated trading zones, (see table 1.).
<table>
<thead>
<tr>
<th>Trading Zones</th>
<th>Description</th>
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<tbody>
<tr>
<td>Inter-Language</td>
<td>Two groups develop a common jargon. An example is the merging of biology and chemistry, which became biochemistry (Collins, et al. 2007).</td>
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<tr>
<td>Enforced</td>
<td>The enforced trading zone is built on a high level of coercion, as in the trade with slaves.</td>
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<tr>
<td>Subversive</td>
<td>The subversive trading zone, is when a culture is imposing on another. For e.g. a product gradually replaces the alternatives. Microsoft Window’s is an example where the user of a PC, more or less is forced to use Microsoft products because those applications are compatible with the hardware.</td>
</tr>
<tr>
<td>Fractionated</td>
<td>The fourth kind of trading zone is the fractionated trading zone, which can exist in two ways; boundary object trading zone that is based on material culture, largely in absence of language and interactional expertise trading zone that is mediated by language rather than material (Collins, et al. 2007). However, the two kinds of a fractionated trading zone do not necessarily have to be separated as the fractionated trading zone can be supported by both kinds (Collins, et al. 2007).</td>
</tr>
</tbody>
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Table 1.

As the fractionated trading zone is built on collaboration between two heterogeneous groups, it is the most appropriate kind of trading zone for understanding university-industry collaboration. In the fractionated trading zone the trade is based on collaboration where the fraction between the two heterogeneous groups become the medium for trade. The boundary object are physical artifacts or representations with different meanings in different contexts but with a structure that is common enough to more than on context for making them recognizable and transferrable for translation. The interactional part of the fractionated trading zone is the language as a mediator for collaboration as a third part understanding the basic requirements of the other actors (Collins, et al. 2007). In this study the term trading zone is used with the understanding of the fractionated trading zone.

Traditionally, a trading zone resembles a trade of physical items. However, trade could also be defined as non-physical merchandise, such as knowledge and information, which is the case for this study. The university and the industry have different characteristics and structures but common advantages in establishing collaboration, which matches the characteristic of a fractionated trading zone as they both have motives for trading with each other. However, because of the need for industrial involvement in the university, organizations must be able to obtain heterogeneous knowledge for continuing on progression (Etzkowitz, 2005). To obtain heterogeneous knowledge an organization need boundary-spanning, both externally and internally to collect and make sense of information (Jonsson, 2010). Traditionally, a boundary-spanner is an individual that operate at the boundaries of the
organization and are engaged in tasks connected to external elements, though a boundary-spanner does not have to constitute an individual (Jonsson, 2010). In order to create a trading zone and overcome the differences in terms of language and structure, a third part could work as a boundary-spanner for translating the differences. Using a boundary-spanner as a third part could also constitute a mediator, which is important in a trading zone perspective (Dooley & Kirk, 2007). Mediator will be the term used in this study, concerning the third part within a trading zone. As a third part the mediator works interactional with expertise in both worlds and can by that facilitate collaboration (Jonsson, 2010).

3. Method

As this study aims to create an understanding of the university and IT-vendor companies, the aim is to create an understanding of the assumption of the existence of multiple realities that are socially constructed. With this reasoning the choices concerning the method of this study will have its standpoints in the methods of qualitative research.

In qualitative research, the context is an important aspect that has to be taken into consideration, especially when trying to theorize the research results (Richie & Lewis, 2003). In this research study, there is one context in terms of the geographical setting and within this setting, there are two different contexts: the university context and the context of the IT-industry. Because there is a specific setting for this research study, in terms of geography as well as the actors in the academy and the IT-vendor companies, this study resembles a case study (Atkinson & Hammersley, 2007).

When doing a case study the purpose is to look into a specific context or setting. However, in this research question the field of interest is broad and contains units where a single, holistic case study may be too abstract and the research question may lose its focus. Because there are embedded units in the larger case and by taking the subunits into consideration, an embedded case study-design is preferable for this research study. It is therefore the larger case that is the major interest of this study (Yin, 2009). The embedded case study design allows for studying units in a wider case and will by that strengthen the analytic tool than if it was a single case study, as the chances of getting a deeper understanding of the field than if just a single actor was to be studied (Yin, 2009).

3.1 The Research Context

This study has its setting within a research and development center called Process IT Innovations, which was established on the process industry’s initiative in northern Sweden (processinnovations.se). The initiative was based on the desire for creating effective collaboration projects for strengthening the research, innovations and the businesses of IT-vendors and the process industry. By this Process IT Innovations currently operates as a mediator for research projects. ProcessIT Innovations is currently expanding towards issues concerning competence development within the sector of IT in the process industry. This study therefore looks at the sector of academy of IT and the sector of IT-vendor companies.

This case study involves five IT companies, three of them are small-medium enterprises (SME:s), SME 1, SME 2 and SME 3. The other two IT companies operate in the consulting business: Consulting Firm 1 and Consulting Firm 2. Both firms belong to larger companies
that operate globally. SME 1 is a product owning-company with Europe as the domestic market. The company delivers software and services for a machine to machine-market. SME 2 operates in the telephone network industry and SME 3 operates within the process industry and delivers IT-solutions for the forest-industry. The larger global companies, Consulting Firm 1 and Consulting Firm 2, both operate in a business and technology market with consulting and system integration in both public service and private businesses.

In this study the Umeå University represents the academy. At the University of Umeå an external relations office is operating in the field between the university and the business world with the aim to provide support for companies and organizations that wish to come in contact with the university. This support focus on five areas; support employability of students, support research collaboration, provide and support commissioned education, provide support for innovation and lead a regional dialog between the University of Umeå and its subsidiary campuses. Besides this, the External Relations Office continually works on establishing relationships between the university and industry, as in collaboration projects. In this study the areas of concern is the support of employability for students and establishment of relationships with the industry, as they involve activities related to university-industry collaboration in education.

For every educational program at the university there is a program chair that is responsible for the specific educational program. This responsibility contains the role as chairperson for the program committee together with representatives from the courses that constitutes the educational program. The program committee meets three times per semester for reviewing the quality of the educational program. Altogether, the program chair is the representative of the educational program; this role contains participation in recruitment events of new students and responsibility for keeping an updated webpage.

### 3.2 Data Collection and Data Analysis

Data for this study was collected through interviews with one representative from each of the IT-vendor companies that are active in the north of Sweden. Also three representatives from the university were interviewed. In the interviews with the IT-companies focus was on their former and current experiences of collaboration with the university, as in what issues and gains they faced in collaboration with the university. The representatives were also asked to express their future desires of university collaboration and their thoughts on how a mediator can facilitate university-industry collaboration (see Appendix 1.).

<table>
<thead>
<tr>
<th>IT Company</th>
<th>Representative</th>
<th>Length of interview</th>
</tr>
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<tbody>
<tr>
<td>SME 1</td>
<td>CEO</td>
<td>20:25 min</td>
</tr>
<tr>
<td>SME 2</td>
<td>CEO</td>
<td>25 min</td>
</tr>
<tr>
<td>SME 3</td>
<td>CEO</td>
<td>37 min</td>
</tr>
<tr>
<td>Consulting Firm 1</td>
<td>Office Manager/ Account Manager</td>
<td>1:20 min</td>
</tr>
<tr>
<td>Consulting Firm 2</td>
<td>Project Manager/ Service Developer</td>
<td>25:35 min</td>
</tr>
</tbody>
</table>
The interviews constitute the empirics of this study and contain two categories; the industry of IT and the university. In the data analysis the interviews were first read and organized into categories of the IT industry’s perspectives of collaboration with the university, and vice versa. Second, the interviews were summarized and categorized into what challenges, possibilities, requirements and motives for collaboration that the university and the IT industry have on each other.

In a trading zone there are different actors with different offers and motives, but also different challenges and demands, which has been the focus of this study and how the trade between actors can be mediated in a trading zone. As the aim of this study is to explore how university-industry collaboration can sustain over time, questions concerning perspectives on challenges, motives, possibilities and requirements for collaboration have been the focus of the interviews.

4. Perspectives of Industry-University Collaboration

This chapter will focus on the perspectives of the university and industry when it comes to their motives for going into collaboration and what they can offer each other in a trading zone. The second part of this chapter concerns the industry’s and university’s perspectives on what challenges they experience in collaboration and what their requirements are before going into a trading zone.

4.1 Motives and Contributions from a University Perspective

For the educational programs of IT the objective for collaboration with the IT industry are many; to offer students a picture of the future working life and the different professional roles, and show students the diversity of companies within the industry early on at the educational program. One of the Program Chairs explains:

“Representatives from different companies can give different perspectives. So that’s one thing, to bring them in here. But then it’s also important for the students to get out and do study visits, degree projects that have a direct connection to the working life. That is extremely important.” (Program Chair, IT Education 1)

The IT Education 1 and 2, both have the same motive for collaboration with the IT industry. However, IT Education 2 has come further in establishing collaboration with the industry, as they have a formal organization for collaboration. By engaging the first year students the IT Education 2 can offer the industry possibilities for building a long-term relationship, as students are in this program for five years. The key is to create a win-win
situation where the companies can see the gain in collaboration for the long-term. The win-win in this example is that the companies can plan their recruitment early and the students can start thinking about the future working life from the beginning of the education:

“In general within the IT-industry today, it is extremely hard to recruit so they realize that if they will have the chance on the whole, then they have to build their brands early on towards the students.” (Program Chair, IT Education 2)

Giving the students a picture of their future working life in the beginning of the educational program will give the students a chance to start thinking about the working life as many students not tend to think about their future until the last year of the program. One example of engaging students early in IT Education 2 is to bring in companies from the IT industry during the first year and offer the companies the possibility to present themselves and the first year students get the chance to mingle with representatives from the companies. After this event the students get to write a report on their future working life, describing what they will be working with and what skills the IT industry expect from a new graduate.

In collaboration with the IT industry the both educational programs of IT aim to streamline the students entry to the work force. The educational programs of IT can, in collaboration with the industry, also provide students other skills that are not traditionally taught in the educational program but that the industry desire, for e.g. how value is generated in a company and how to communicate with a customer. The university also has a motive in improving quality in the educational programs of IT and higher the quality of the lowest level of students.

The university’s most important contribution to a trading zone is the possibility to offer the industry a collected group of people that are studying a subject relevant to the industry of IT and its operations. For the industry, the university can constitute a win-win situation by offering an interface towards the students, where the industry can get to know the future competencies and plan for future recruitment. This is currently important as the industry of IT is facing problems with finding new recruitment. Collaboration with the university is therefore a setting for promoting the own company and gets an opportunity to engage in students from the beginning and have the possibility to impact on formation of the educational programs of IT. By providing real cases, students can apply knowledge but also develop the soft skills required in the industry, for e.g. interpersonal skills when working with others in projects.

4.2 Challenges and Requirements from a University Perspective
In order to offer the IT industry a chance to engage in students and involve in formation of the educational programs, the collaboration must pervade during the whole period of study. In this way it is more likely for educational programs of IT to streamline desired competencies in students before entering the work force. However, the Program Chair does not have the authority to force the educational programs into collaboration with the IT industry. This means that collaboration with the IT industry is dependent on the individual teacher of each course and his/her prioritizing of time and engagement, which makes the industry collaboration uneven from year to year. The main reason is that collaborations in educational
programs often requires time prioritization for the teachers, as some teachers prefer spending more time on instruction than industry-collaborations. Establishing a long-term and sustainable collaboration with the IT industry is therefore important in order to increase the chances for it to be leveled up through all year cohorts:

“...if we just have a lot of selective measures it might be that one student has industry collaboration on every course, and the next student, the year after get nothing so then you’ll get an uneven quality.” (Program Chair, IT Education 2)

Another explanation for this unevenness is differences in views about whether it is appropriate for the university to engage in the IT industry and vice versa. As collaboration with the industry is dependent on individuals, it therefore becomes a challenge to establish long-term collaboration. An additional challenge is to engage students, as not all students tend to show up when companies are visiting the university:

“That happens frequently. And I believe that it has to do with the fact that students are extremely rational. They think: ”~ Is this something that will examine me? Probably not, so I can ignore it.” Many work at the same time and then you prioritize what is most important in order to pass the course. And of course, we don’t want to end up there.” (Program Chair, IT Education 1)

The experience from a university’s point of view is that the most ambitious students are more likely to show an interest in industry collaboration, while those students that probably need it the most are absent. The challenge is therefore to make students engaged in the industry and become more forward-looking in terms of their future career:

“It’s about creating a climate in the classroom that makes you understand why you bring in people and why you think it’s important. And I believe that it’s not about: ”~ Hi, I will present my company”, cause that’s not important to anyone in the same way as someone from a company presents a real problem that has actually been discussed on the course and gives a perspective.” (Program Chair, IT Education 1)

A challenge here is therefore to make the industry collaboration integrated as a mandatory part of the courses in the educational programs of IT. From the university’s point of view, it is also important that collaboration with the industry must be put up for all students, as there is wish to increase the abilities for students with the lowest performance. This is another challenge as the industry is more often interested in the best preforming students and the educational programs have an interest in engaging all students:
“We were gonna do a mentorship project when the companies realized that:
“- Wait a minute, it’s for **all** students in the program, not just the best ones.” So then all companies would engage with the understanding that they get the best students ...and as a Program Chair I engage in **all** students, not just the best, the most driven ones.” (Program Chair, IT Education 2)

As there is a challenge to get companies to engage in all students and get all students willing to engage in industry-collaboration, there is also a challenge to engage all teachers in believing that collaboration with the IT industry is important. In IT Educational Program 2 a possibility of capacity building for the teachers has been established. The Program Chair of Educational Program 2 has tried it:

“I have done the traditional academic career, bachelor education, post graduate education, research, so I never worked at a company, never worked with what I teach students so I have missed that reality. It was extremely rewarding and I would like to do it again... ” (Program Chair at Educational Program of IT 2)

As the educational programs of IT have an interest in securing quality of the educational programs by getting all students engaged in industry collaboration, it becomes a tension when the IT industry wants to pick out the best students for collaboration. The university also faces an internal challenge as not all teachers believe that industry collaboration is important and might not have the time it takes to engage in that kind of collaboration.

**4.3 Motives and Contributions from a Industry Perspective**

From an industry perspective, collaboration with the university has several motives; to establish a dialog, as it is a good way to create an understanding for each other, promoting the own company and getting use of an efficient resource of new input and inspiration:

“As I normally put it; if you want to succeed with your business you have to use all resources you have, and the university is a big resource.” (CEO, SME 1)

Collaboration also offers opportunities to get to know and plan for future recruitment. Degree projects are therefore hold as a good way to recruit because the industry is dependent on what is being produced, as in recently examined students. It is also an effective way of getting new input to the organization, which hopefully gives the ability to employ the student:

“Its great when we get a contact and someone writes a thesis during ten weeks time, which is the world’s longest job interview, so that is really great.”
(Project Manager/Service Developer, Consulting Firm 2)

By collaborations the industry can provide a picture of the real world and hopefully give capacity building to the university by informing the university about coming trends in the industry:
“The industry has a lot to teach the academy as well...
There are a lot of things going on, so I think many professors etc. need an update about what’s going on...” (CEO, SME 3)

Some desired competencies in the IT industry are not traditionally taught in the educational programs of IT, such as understanding business models and what generates value in a company. By offering a picture of the real world, the industry can create a possibility for students to apply and attain new knowledge. This kind of involvement can also support the teacher, who perhaps have done his/her career path within the world of academics and never entered the industry. The industry can also provide input for how to form the courses within the educational program so they match the demands of the market.

4.4 Challenges and Requirements from a Industry Perspective
Collaboration with the university is always a question of what the specific company gains from giving guest lectures, providing real cases and degree projects. Even though real cases and degree projects are good ways of getting new input to the organization there are often difficulties in releasing sensitive information and especially time, as time is money in the IT industry. A strong requirement for going into collaboration is the establishment of a win-win situation, and to make up plans for what outcomes both parts are expecting.

“What I’ve seen many times is that you bring out stuff that makes a very nice report and a professor becomes really happy, but it didn’t result in advantages for the industry, so you have to put up your goals early on so it wont become something just stacked in a folder.” (CEO, SME 3)

Getting an outcome is especially important for the SME-companies, as their reality is more sensitive to shifts in the market and cannot make up plans that are to far from their current reality. This makes it difficult for the SME:s to establish long-term collaborations and makes these companies more interested in last year students doing degree projects than engage in first year students:

“I just have one interest in these kinds of collaborations, and that is to bring in the advantages of the industry into the university...
...as a small SME-company its SEK – you have to make money on what you do, its as simple as that.” (CEO, SME 3)
“...companies don’t buy things just for fun, there is always an idea a business acumen behind it. In particular business-to-business-selling, I think it’s strange that it’s not brought up at Swedish universities... I think you can study that in the USA, but not here.” (CEO, SME 2)

Even though the global companies can afford a long-term collaboration, they are also most interested in students doing degree projects as they are in constant need for new recruitment, and providing a degree project is an efficient way for getting new people into the organization. However, collaboration is always a question of time management and requires detachment of resources from the ordinary work, especially for degree projects when the company has to find a supervisor, which is a problem for both the SME:s and the consulting firms. In the IT-consulting firms the employees are often out working at the customer’s site and might not be aloud to bring in a student to the customer, which creates conflicts in time and efficiency:

“You could say: “- Dear customer, we will bring in a student who will fix this.” It could be done with their (the customer) kindliness but we won’t be able to engage and charge the same way.” (Office Manager/ Account Manager, Consulting Firm 1)

Also when offering an in-house project, the consulting firm cannot ensure for how long the employee will be in-house as customers can call for consultants at any time. Because of issues concerning time and changes of demands in the market, it is hard for all IT-companies to create strategies for how to establish long-term collaboration with the university.

When it comes to future recruitment, it is difficult for all IT-companies to plan the future need of new employees. The SME-companies are more market-sensitive than the global companies and cannot be sure of their future existents. The global firms can be more assure of their future existence and are always in need of new recruitment, however, they cannot be as sure of the market-demands, as the market of today is in constant change, which makes it hard to plan for future recruitment:

“Unfortunately it goes faster and faster... the customers are filled with demands to go faster, which mean that new recruitment is hard to plan, as they might need ten new people the next day.” (Office Manager/ Account Manager, Consulting Firm 1)

In collaboration with the university, the IT industry is often dependent on the incentive from the university as it is hard to get the right information from the university when not knowing the right person to contact at what educational program. Interchange of information between the university and industry could therefore be clearer than what it currently is, as it does not reach out to the business world:
“...if you don’t have the contacts in the university its harder to get information about when students will do their degree projects, when they graduate... I don’t think the business life is at the information list concerning that kind of information... because at most times when we define a degree project, we think: 

"- This is suitable as a degree project. Well, then we have to fix one.” Then it turns out that it is a year until they (the students) will do their degree project, so that idea went down the drain. That is something that could be improved.”

(Project Manager/Service Developer, Consulting Firm 2)

In general, it is hard for IT companies to reach the university without knowing the right people to contact within the university. Some of the companies argue that a kind of common system could be an improvement. One of the SME-companies suggests a general bridge into the university:

“I think its hard to know where to go so that is why I think ProcessIT could be really great because it could be a bridge, an entrance to the university and point out where to go within the world of the university. Otherwise you’ll never find your way.”

(CEO, SME1)

In contrast, one of the global companies think that a requirement for collaboration with the university should continue on being dependent on individuals:

“Spontaneously, I think it would be great with one way into the university but it’s not really reasonable, I don’t think it... how would that work? They (the university) have different interests and motives, so I think it has to be pretty shattered...we do want this collaboration but it has a lot to do with the university’s wish to contact us so therefore we have to make ourselves noted so we get contacted.”

(Office Manager/Account Manager, Consulting Firm 1)

Some of the companies argues that the Umeå University could be better in adapting information from the industry concerning the formation of educational programs of IT, as they currently not always match the demands of the market. However, the companies think that it has become much better through the years but that there is still some work to do concerning the adaption of information from the IT industry.

“...I don’t think they ever asked us properly about what we think they should study and so on. I think it has changed a bit for the better in 20 years but it is really marginal. And if they are serious about that they think it is important to know what we think and so on then I really think they could ask us more properly and also absorb if they think it’s really important. ...I get the feeling that most of the management of the University, or management of the institutions, they want to educate researchers... that’s like the main thing. And we want to manpower and there is a tension.”

(Office Manager/Account Manager, Consulting Firm 1)
“When you look at other universities, they are really into it, and the technical university of Blekinge want us to form courses and education from what future needs we see.” (CEO, SME 1)

As already mentioned, according to some of the companies, the university lacks the business thinking, also in teaching students.

“...my big criticism to the university is the total absence of educating... like teach people how to sell, to consult, business-to-business. Its like: “- Its so commercial and ugly – selling is ugly” and I think its a really serious criticism that they don’t capture this.” (CEO, SME 2)

Understanding the business thinking and what is actually happening in the IT industry seems to be a reason of problems of connecting with the university. The industry has a need for collaboration but as the structures and organizational thinking differs from the university’s challenges arise, mostly concerning different time frames. In the IT industry the time demands are often big encounters and the thought of time as money becomes more fundamental than what it is in the operations within the university.

5. Mediating in an University-Industry Trading Zone

The University of Umeå has an Office for External Relations, which is currently a kind of mediator between the University of Umeå and the surrounding business life. The overall motive of the Office of External Relations is to capture needs of the educational programs of Umeå University and the needs of the outlying business world, in order to establish relationships between those. By operating for collaboration between the university as a whole and the industry, the Office of External Relations can provide an interface between the industry and university by having a representative role of the university and strengthen its brand name.

The Office of External Relations has a motive in increasing the employability of students and provides students with support in CV-reviewing and career guidance. They also provide a database where companies can upload advertisements for job opportunities, degree projects and trainee-positions in order to come in touch with students. The Office of External Relations can also provide companies assistance in the formation of degree projects.

The Office of External Relations often finds it hard to match needs of the university and needs of the industry, which shatters focus of the Office of External Relations. The needs of the university are often snapshots and in constant change:

“How can we systematically capture all internal needs? Even if we visit every department, it will be a snap shot: “- Today we have these needs, today we have these obstacles, today we have these possibilities for collaboration” Next year it is something totally different.” (Project Manager, Office for External Relations)
The aim for the Office of External Relations is to operate over the whole Umeå University and the surrounding business life has shown to be a hard task, as it requires focus on several areas within and outside the university at the same time. This becomes a problem for the Office of External Relations as the contacts with the business world within the university are on a department level and attached to individual researchers who are not keen on letting go of their personal contacts in favor for the whole university:

“How can you find a person, a function or a way of thinking to make this more sustainable, so it’s actually the university that has the relation, not the individual. Without steeing... cause I mean the researchers are really afraid, of course, cause they have built up a relation with a company so they get funding’s, research queries, they can even develop products, and then someone from an administrative level comes and says: "- I want this contact!"” (Project Manager, Office of External Relations)

To capture the needs and current relations that every institution has with the business life is a big challenge for the Office of External Relations as they might not even know about the current collaborations within each department, for e. g. they might not have an insight in the formal organization for industry collaboration that as in the case of Educational Program of IT 2, as that organization was initiated on a faculty level.

### 5.1 Third Party Mediator in the University-Industry Trading Zone

Many collaboration projects between university and IT industry are dependent on the engagement of single individual’s, by that collaboration might face the risk of a collapse if the individual leaves his/her position. The dependence on the single individual is a problem, both at the administrative level as in the case of the Office of External Relations, and also on the educational level where collaboration is dependent on the individual teacher. Therefore, it is crucial to find a way to manage and maintain the contacts with the industry without total dependence on the engagement of single individuals.

Currently, the Office of External Relations operates as an official mediator for collaboration between the university and industry. However, the Office of External Relations is part of the University of Umeå and not a neutral mediator as a mediator in a trading zone (Dooley&Kirk, 2007). Rather than being a mediator with knowledge about both university and industry, the Office of External Relations is understood as an academic representative. In this way the Office of External Relations is not a third party mediator in the same way as ProcessIT Innovations.

ProcessIT Innovations is an R&D centre that works together with universities, IT companies and process industry on new competitive automation in the region of northern Sweden (processitinnovations.se, verksamhetsberättelse, 2011). Currently, the operations of ProcessIT Innovations is to create collaboration projects between researchers and IT companies that together with the process industry can solve challenges faced by the process industry. By this ProcessIT Innovation already have the experience of being a third party mediator with an understanding of both university and industry.
With the connection of both the university world and the IT industry, ProcessIT Innovations can offer another way of looking at mediation for collaboration as it is not a representative of Umeå University, as in the case of the Office of External Relations. Instead, ProcessIT Innovations is a neutral part with knowledge about the university and the IT industry and can by that operate as a mediator in the trading zone of collaboration between the IT industry and university. Because ProcessIT Innovations operates in the field of IT and has roots in the universities in northern Sweden, the ProcessIT Innovations has a more intimate connection to both the IT industry and university in terms of an own network. However, ProcessIT Innovations has a limited focus of the IT industry and process industry and not the whole surrounding business life as in the case of the Office of External Relations. Although ProcessIT Innovation should have a better prerequisite of being a mediator between the IT industry and the educational programs of IT as ProcessIT Innovations operates in the field of IT.

Some of the interviewed IT companies in this study have experience from collaboration with ProcessIT Innovations. To find your way into the university as a company, many of the interviewed companies view ProcessIT Innovations as a possible mediator for collaboration with the university:

“**You have to have an understanding for each other and try it out in the industry. Degree projects, projects, like ProcessIT is a really good part way to work with.**”
(CEO, SME 3)

“I believe in continuing to work in the style of ProcessIT, and if I speak for other companies as well, then you have to find a way and that is the first step to collaboration between business life and university. ”
(CEO, SME 1)

As the Office of External Relations is operating on a generic basis for the whole university, they have a problem in generating knowledge in specific fields:

“...**our problem, considering that we are suppose to be general and generic, is that we will never reach to the same level of knowledge that ProcessIT does.**”
(Project Manager, Office of External Relations)

In general, the interviewed IT companies have a wish for the information between the university and industry to flow smoother, as it makes it hard to get inside the university if you don’t know how to find the right person.
6. Discussion

The objective of this paper was to explore the possibilities and challenges for university-industry collaboration in IT education. In exploring this research question, this study applied the trading zone framework with the aim to explore how university-industry collaboration can be mediated to sustain over time. In this study both challenges and possibilities for collaboration have been identified. Among possibilities four areas of possibilities were identified: knowledge exchange, capacity building, ability to apply knowledge and planning recruitment. Among challenges, three areas have been identified: time management, dependency on individuals and contextual factors.

6.1 Possibilities and Challenges

Collaboration between the university and industry has potential possibilities that both parts can gain from. In collaboration with the university knowledge exchange is an efficient way for IT companies to get new input and ideas into their organization when for e.g. providing students real cases from the IT industry. In return, the student’s get a chance to apply their knowledge on real cases provided by the IT industry. Giving a possibility to apply knowledge might also give students knowledge about business thinking, communicating with a customer etc. that are not always thought at the Educational Program of IT. In this way, the IT industry can contribute to a stronger foundation for future recruitment and by collaborating with the university the IT industry can make up plans for future recruitment.

Working in a trading zone has challenges in identifying the values for collaboration as a trading zone for university-industry collaboration is about exchanging knowledge and not physical products. Identifying and matching values for both industry and university is therefore a challenge as the formations of knowledge transaction becomes crucial, for e.g. both the university and industry points out the importance of creating a win-win situation and setting up future goals of the desired outcomes of collaboration. In order to identify and match values negotiation in the trading zone becomes essential. As the university and IT industry are very much two different worlds with different outlying conditions, a neutral mediator with understanding of both worlds can enable this immaterial trade.

Time management is a big challenge for both the university and IT industry. In the IT industry things are happening fast and IT companies have to be prepared of fast changes and the need of new resources. As collaboration with the university requires detachment of resources, it is hard for IT companies to reserve resources for university collaboration. Time challenge does also connect which the challenge of individual dependence, as the individual has to have the time to spend on constructing and maintaining collaboration.

When collaboration is dependent on single individuals it becomes fragile and will face the risk of collapsing if the individuals for some reason won’t be able to further engage in the collaboration, which goes for both university and IT industry. On the other hand, it is hard for university and IT industry to reach each other in the first place without having individual contacts.

Another challenge identified is the organizational differences that are outcomes of the different contexts. The context of the IT industry is characterized by a hard competition with a fast changing market, which affects the actions of the IT industry. As mentioned in chapter
4.4, IT companies always have a business-thinking behind their ideas and actions have to be profit-driven in order to survive in the market. In contrast the IT industry, the university exists in a more constant environment and do not have to worry as much about competitors and use a business-thinking. However, the university still has some pressure in offering good quality in the educational programs in order to get students and allocations, though this pressure is not as instable and fast changing as for the IT industry. The contextual differences therefore become challenges when trying to match the university and industry to establish collaboration.

Another aroused challenge is the engagement of students, to get students to understand the importance of industry collaboration and what they will gain from it in terms of preparation for the future working life.

6.2 Mediating for Value Creation

This study has shown that both the Educational Programs of IT and the IT industry view university-industry collaboration as important for knowledge exchange as in value creation. This can be understood by the background of the university’s shift from mode 1 to mode 2 (Harloe & Perry, 2004), where creating value has gone from a linear development to a constellation where the actors are interlaced in the process of value creation (Normann & Ramirez, 2000; Vargo & Lush, 2004; Etzkowitz, 2005).

Value constellation is about exchanging knowledge, as trading in a trading zone where both parts have something that the other part wants (Galison, 1999). In the case of university-industry collaboration trade constitutes exchange with knowledge. As the university and industry are two different actors with different contextual factors, it is sometimes hard to understand each other’s operations and environments, which can trumpt the knowledge exchange (Collins, et. al, 2007). Knowledge exchange between university and industry can therefore be facilitated by a mediator who has knowledge about the both actors and their environments (Harloe & Perry, 2004; Kellogg, 2006).

Using an approach of value creating, the processes of university and industry could, to the extent possible, be interlaced in a trading zone. For e.g. the interviewed IT companies of this study argue that the university lacks the business thinking, that is traditionally not taught in the educational programs of IT. By using business thinking for interlacing the processes of university and industry, ProcessIT Innovations can as a mediator use its network to connect a IT company with a certain need with another IT company can provide the solution. As ProcessIT Innovations also has connections in the university that students can to some extent be involved in this connection. Here, the value creation here is to get use of a network and establish constellations of students and companies that can co-create value.

7. Conclusions

This study had the objective to explore the possibilities and challenges for university-industry collaboration in IT educations and applying the trading zone framework with the aim to explore how university-industry collaboration can be mediated in order to sustain over time. In answering this research question, the trading zone framework with a third party mediator
have facilitated the focus on university and industry, which is important for how trade between these two actors can be mediated.

Many attempts for collaboration between the IT industry and the educational programs of IT have been made, mostly through guest seminars, lectures, degree projects and minor student projects. However, these attempts have been made on a sporadic basis and made it difficult to obtain a sustainable collaboration for the long-term. At present, the connections between the IT industry and the educational programs of IT are dependent on individuals from each part having a contact or connection with the other. This means that the current collaboration, such as guest seminars is dependent on these individuals, which makes it difficult to obtain a consistency in collaboration over time.

The identified requirements for having successful collaboration is to put up plans for what the desired outcomes are, which is crucial for creating a win-win situation. In order to create this win-win situation a business way of thinking is to some extent required for matching the context of the IT industry. In university-industry collaboration students need to be engaged and the formations of collaboration is important for this engagement, as well as establishing win-win collaboration.

Establishing a long-term collaboration requires stability. As the university operates in a more stable environment than the IT industry, where flexibility and a constant changing environment is a part of everyday life, matching these two world’s is one of the biggest challenges.

In this study focus have been set to the Educational Programs of IT at the University of Umeå and IT companies operating in northern Sweden. These limitations have therefore left out the students studying at the educational programs of IT. For future research it could be interesting to look at the students point of view when it comes to industry collaboration, as well as look into other educational programs, companies and industries.
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