Key Motivation Factors to Establish Student-University-Industry Cooperation Projects: Empirical Evidence and Practical Implications

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Abstract

Student projects at universities that involve industry partners can provide an up-to-date learning environment that helps to develop skills for a successful career in industry. There is a considerable amount of literature on motivation factors within a dyadic cooperation, e.g. between students and universities, but there is little knowledge about the triad. Therefore, this paper addresses the research question: "What are the key motivation factors of stakeholders in student-university-industry (SUI) triads that promote cooperation in projects?" First, we analyzed studies that investigated the motivation factors to cooperate in SUI-triads. Then a survey was performed addressing all stakeholder groups. The results demonstrate that students are highly motivated to cooperate if they have opportunities to test their knowledge in practical environments. Universities are motivated to cooperate with both students and industry representatives in order to receive support for their research topics. A key motivation for industry partners is access to qualified students.

Keywords: student-university-industry projects; cooperation; motivation; triadic relationships.

1. Introduction

This paper is about the motivation of the three stakeholder groups students, universities and industry, to cooperate in different projects, e.g. master or doctoral theses. Cooperation between these stakeholder groups can provide benefits for each of them, for example practical experience for students, additional research funds for universities or access to qualified students for companies. These benefits are the result of an up-to-date learning environment, involving students, university and industry. A "Student-University-Industry (SUI) triad" is a framework that considers every possible dyadic relationship between the three stakeholder groups and the motivation of each stakeholder. The SUI model shown in Figure 1 depicts the SUI-triad by combining three dyadic relationships (Kerschenbauer et al., 2013). In our thesis we aim to identify the specific motivation factors of each stakeholder group cooperating within an SUI-triad. Information about these motivation factors is essential in order to ensure a successful cooperation with a positive outcome for each stakeholder group. In other words, it is necessary to investigate not only relationships between just two of the three stakeholder groups, but also the triadic cooperation of students, scientific staff of universities and industrial partners. On the basis of a literature review, interviews and an online survey we therefore addressed the following research question: *"What are the key motivation factors of stakeholders in student-university-industry triads that promote cooperation in projects?"*

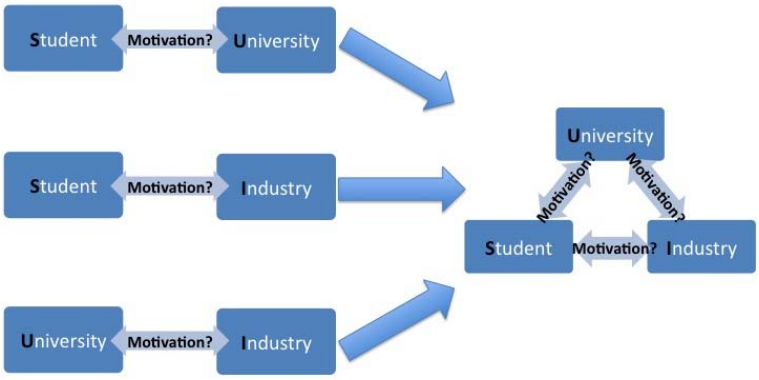

Figure 1: Combination of SUI-dyads

2. Theory

This section aims to identify specific motivation factors of students, universities and industry. Although there is a considerable amount of literature on motivation factors within a dyadic cooperation between just two of the three stakeholders, there is little evidence about the specific triadic collaboration – the SUI-triad. The conducted survey, however, showed some important additions. The viewpoints of the three stakeholder groups "Students", "University" and "Industry" are highlighted in the following three sections:

2.1 Stakeholder Group "Students"

Many bachelor or master theses and other projects which are part of students´ higher education are accomplished through cooperation in an SUI-triad. It is worth noting that students frequently invest the most working hours compared to the other stakeholders. Therefore, students possess a key role within that constellation and it is very important to ensure their motivation. A crucial aspect of motivation is the integration of students into the university system, so that they are able to identify themselves with their universities. Furthermore, students should frequently be encouraged by universities to work on their own account and independently. This would positively affect their employability and in further consequence their motivation in cooperation. As the later financial gain is essential for student's motivation, it is important that students are aware of such a chance to receive job offers from the company or university they are cooperating with (Esslinger & Vogler, 2009; Williams & Williams, 2011). According to Rohrbeck and Arnold this seems to strengthen both the motivation to cooperate with universities and the motivation to collaborate with companies (Rohrbeck & Arnold, 2009). Other significant sources of motivation are competent and dedicated teachers and lecturers. They should not only be professionals in their field of study, but they should also know how to deal with the strengths of their students. Students learn through challenges, so it is important that teachers challenge their students. Furthermore, it is important that students are aware of the meaning and importance of the subjects they are learning for their later jobs. Therefore, the method of teaching is an essential factor for motivating students. In addition, the learning and working environment provided by a university or company is crucial for highly motivated students (Williams & Williams, 2011). To sum up, according to Williams and Williams there are five key ingredients to motivate a student: Teachers, content, method, process and environment (Williams & Williams, 2011).

2.2 Stakeholder Group "University"

Because of providing a learning environment for students and having a close relationship to the industry, the stakeholder group "University" is considered to be the linking element of a SUI-project. The fact that the universities receive public sponsorship in most cases might lead to the view that it is their legal responsibility to cooperate with students and industry in order to use public money responsibly. However, employees of universities do not necessarily see themselves as government representatives "fulfilling a legal mission". In fact, it is the employees' personal goals like climbing the career ladder that influence the motivation of university employees to cooperate in SUI-projects. Employees of universities with a focus on technical/scientific or medical subjects have much more possibilities to work together with industry. Especially technical and medical universities frequently conduct research in fields that are very interesting for companies of the same sector (Bauer, 2012), but before we discuss the industry's motivation to cooperate in SUI-projects, the motivation factors of the stakeholder group "University" shall be addressed in more detail.

Research has so far mainly focused on motivation factors of universities that are related to university-industry relationships. An important aspect of universities' motivation is represented by the opportunity to receive additional (research) funds. The prospects of more concrete and more interesting research results are especially attractive for scientists (D'Este & Perkmann, 2010). Besides additional funds, according to Meyer-Krahmer & Schmoch the exchange of knowledge is the most significant motivator to collaborate with the industry. Universities and their scientists seem to be interested not only in applying their theories in practice, but also in working with the newest innovation of industry in their research and teaching. The authors also state that the primary motivation of university scientists cooperating with the private sector is recognition within the scientific community through, for example, publications or grants. The secondary motivation factor is financial gain and a desire to secure additional research funding, mainly for graduate students and lab equipment (Meyer-Krahmer & Schmoch 1998). Furthermore, the study of Slotte and Tynjälä emphasizes the importance of students receiving practically oriented education through cooperation with industry. In addition to that, Slotte and Tynjälä consider gaining practical support in form of material or financial resources as a motivation factor for universities to collaborate with industry. Establishing links with industry in order to support long-term relationships between universities and industry is also another essential motivation factor of universities (Slotte & Tynjälä, 2003). The study of Lai discusses several motivation factors of universities when cooperating with companies. First, access opportunities to handle and operate special instruments are mentioned.

Second, practical experience and additional financial support from industry are seen as positive impacts. In that study university representatives also mentioned providing working opportunities for graduates as a main motivation factor. Third, that study indicates that knowledge exchange in terms of combining industrial practice and academic theory are attractive motivation factors for universities to engage with the business sector (Lai, 2011).

2.3 Stakeholder Group "Industry"

In the context of this paper, the stakeholder group "Industry" includes companies and firms cooperating with universities and students. There is much information available about university-industry relationships but very little information about student-industry relationships and the respective motivation factors for cooperation. One of the most important advantages firms are able to receive through participation at university projects is the access to qualified students. The future existence of a company, especially in a technological sector, is highly dependent on their prospective employees or chief executives (Roessner et al., 1998; Ponomariov, 2009). However, previous studies have suggested that universities should show much more commitment to collaborate with the industry to further increase the motivation of industry to cooperate and therefore to better results of SUI-cooperation (Marzo-Navarro et al., 2008). Besides the access to qualified students, universities provide several technological advances such as specific laboratories. As the industry is interested in scientific development and solutions to its technical problems, it thus benefits from cooperation with universities, which furthermore help save money on technology and staff resources. Moreover, risks for long- and short-term research projects are manageable for both stakeholder groups (Rohrbeck & Arnold, 2009; Meyer-Krahmer & Schmoch, 1998). Another interesting motivation factor for the industry is the ability of universities to develop new technologies and new ideas for products. To put it in another way, industry is highly interested in upgrading its research and development (R&D) capability through collaboration with universities (Lai, 2011). Furthermore, Siegel et al. suggest that the primary motivation factor of firms is financial gain. The secondary motives are facilitating technological diffusion and securing additional research funding (Siegel et al., 2003). The work of Autio et al., however, has shown that financial, technological and educational motivators mostly influence industrial willingness to collaborate (Autio et al., 1996). According to Mead et al., there are many reasons for establishing university-industry cooperation. These reasons include fulfilling an organization's educational mission, accessing education and training resources, gaining competitive advantage, addressing business growth, achieving cost savings, enhancing organizational reputation, increasing revenue, accessing research and tool resources and providing a staff source (Mead et al., 1999).

3. Method

As mentioned before, there is still a need for discussion on the special relationship between all of the three stakeholder groups. Therefore, a literature review about the fundamentals of motivation and cooperation from the viewpoint of the three stakeholder groups has been conducted and the results of studies dealing with motivation in SUI specific relationships have been analysed. With the results of the literature review, it was possible to identify concrete motivation factors behind SUI-relationships. In order to confirm those results, 42 people, representing each stakeholder group, were interviewed. By considering both the literature review and the interviews, we were able to identify the motivators and develop required questions for the online survey. Finally, the survey was implemented and the results were analysed. Figure 2 shows the whole procedure of doing the literature review, conducting interviews, preparing the survey, implementing the survey and finally generating the results.

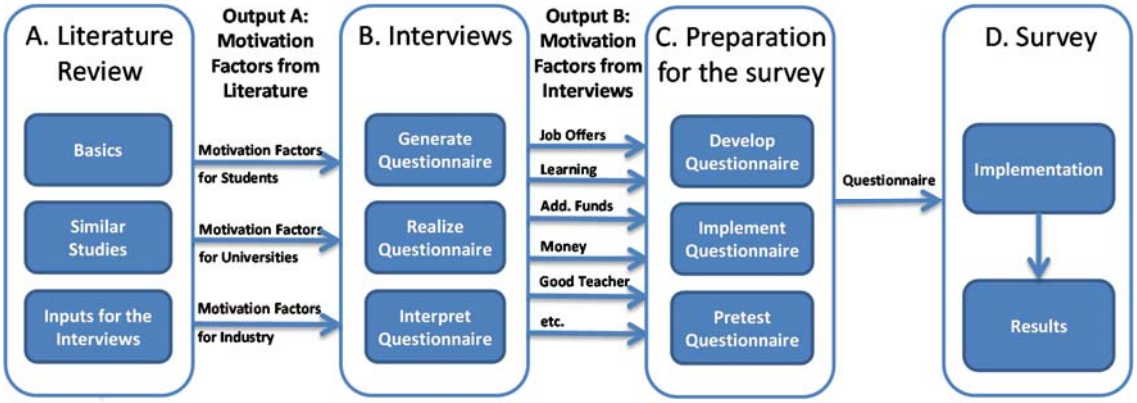

Figure 2: Method

3.1 First Stage: Interviews

The interviews were conducted to gain information about motivation factors which are not mentioned in the literature. In total, 42 people of the three stakeholder groups were interviewed. 15 of the interviews were held with engineering students of Graz University of Technology (TU Graz) and Vienna University of Technology (TU Wien).

15 interview partners are professors and university assistants of engineering institutes of the TU Graz. 12 of the 42 interview partners are industry related people, working as executive staff members in sectors like car industry or chemical industry. As expected, all motivation factors generated through the literature review were considered to be very important by the interview partners. In all stakeholder groups, interviewees were asked for further motivation factors. These were considered in the development of the following survey and will be pointed out in Section 3.2.

3.2 Second Stage: Survey Study

In order to generate detailed information about the three stakeholder groups it was necessary to poll a bigger group of participants. Therefore, an online survey was conducted. The respective questionnaire was based on information about motivation of students, universities and industry to cooperate in an SUI-triad that we gained through the literature review and interviews. 310 people took part in the following study, 265 of them completed the whole questionnaire. In the following statistics, only these 265 completed questionnaires are considered. There were 28 female participants and 237 male participants. Most of the participants (N = 141, 53,21%) belonged to the group of industry. Almost one quarter of the participants (N = 63, 23,77%) were people who consider themselves mainly related to the university. The remaining quarter (N = 61, 23,02%) of the participants were students. Out of these 61 students, the majority (N = 53, 86,89%) was studying engineering with a focus on economy; a small part (N = 4, 6,56%) was studying a purely technical course of studies. One participant (1,64%) was doing a purely economy study; the remaining students (N = 3, 4,92%) were doing any other course of studies. The survey was conducted using the web-application Lime Survey.

In total the questionnaire consisted of 25 questions. The questionnaire contained a common part and two stakeholder-specific parts for each of the three stakeholder groups. Students had to answer four common questions and seven student-specific questions. Industry-related participants were asked two common questions and seven industry-specific questions. Participants related to the university also had to fill out two common questions and seven university-specific questions. The common part consisted of questions regarding the sex of the participants and to which stakeholder group (student, university, industry) they thought they were related to most. In addition to that, students were asked about their field of studies and which part of their studies they were doing right then (e.g. master or bachelor programs). In the stakeholder-specific parts, people were asked to rate the listed motivators regarding cooperation with an opposite stakeholder group. A five-level Likert scale, ranging from very important (1) to very unimportant (5), was used to rate 55 items.

4. Main Findings

The findings of the survey show good correlation with the findings from the literature. However, there is a set of motivation factors, which were not explicitly described in the literature but are still noteworthy, as they seem to be of importance for the stakeholder representatives. The in section 2 mentioned motivation factors which have not been discussed in the literature so far, but were used as additional items that resulted from the interviews, are formatted bold. A total number of 61 students answered the survey and ranked the 22 items.

Table 1 lists those motivation factors that they ranked highest.

"Student Items"	Rating
Practical experience	1,20
Useful skills / Increased employability (through industry collaboration)	1,36
Personal career	**1,46**
Job offers (from industry)	1,49
Competent teacher or mentor	1,54
Useful skills / Increased employability (through university collaboration)	1,56
Good environment	1,56
Establishing social contacts with industry	**1,59**
Establishing social contacts with university	**1,66**
Autonomous working	1,69
Job offers (from university)	1,69
Challenging assignments	1,74
Good environment	1,82
Sympathy to the university / institute	**1,92**

Bold text = additional items that resulted from the interviews
Rating: 1 = very important, 5 = very unimportant

Table 1: Motivation factors of students

A total number of 141 industry representatives answered the survey and ranked 19 items. Table 2 lists those motivation factors that they ranked highest:

"Industry Items"	Rating
Direct access to qualified students (through student collaboration)	1,36
Indirect access to qualified students (through university collaboration)	1,60
New ideas (through university collaboration)	1,65
Knowledge Exchange	1,87
Scientific aspects (Research & Development)	**1,98**
Access to qualified university assistants	2,00
New ideas (through student collaboration)	2,01
Improvement of processes and technologies	2,11
Objectivity of universities in evaluations	**2,11**
Long-term financial gain	2,14
Commitment of the universities	2,18
Knowledge Exchange	2,18
Establishing social contacts with the "academic world"	**2,23**

Bold text = additional items that resulted from the interviews
Rating: 1 = very important, 5 = very unimportant

Table 2: Motivation factors of industry representatives

A total number of 63 university representatives answered the survey and ranked 14 items as shown in Table 3.

”University Items“	Rating
Receiving support for specific research topics (from an industry partner)	1,52
Receiving support for specific research topics (from a student)	1,57
Additional funds from industry	1,70
Further training for university assistants (through industry collaboration)	**1,76**
Getting basic research topics supported by industry partners	1,79
Social responsibility	**1,86**
Establishing social contacts with industry partners	1,87
Getting basic research topics supported by students	2,02
Further training for university assistants (through student collaboration)	**2,08**
Establishing social contacts with students	2,17
Receiving job offers for students	2,21
Recognition within the scientific society	2,24
Job offers for university assistants	**3,13**

Bold text = additional items that resulted from the interviews
Rating: 1 = very important, 5 = very unimportant

Table 3: Motivation factors of university representatives

5. Discussion and Conclusion

The popularity of projects in SUI-triads has been rising for several reasons. Due to the various viewpoints and various values of the different individuals, however, a triadic situation is much more complex than a collaboration between two stakeholder groups. In order to improve SUI-cooperation, it is helpful to understand the motivation of each of the three stakeholder groups in such projects. Improving the total output of such projects by promoting the exchange of knowledge which do not generate extra costs for the giving party, might also generate a benefit on a market: The knowledge about these factors might help to gain - or just highlight - certain benefits in a triadic project and therefore “win” in a market which has as shortage in one or two of the related stakeholder groups.

Besides some motivation factors like practical experience seem to be obvious to the cooperating stakeholder groups, we demonstrated that in many cases motivation factors affecting long-term relationships are taken into account. In many cases, these factors tip the scales in decision making, for example, concerning the decision on which project of which industry partner is promoted to students or which university institute is chosen by the best students, i.e. the universities’ best potential future employees. For students practical experience and useful skills such as practical experience are of high relevance. University representatives, on the other hand, mainly want to receive support for their specific research topics. According to the results of Kerschenbauer et al., which are the basics of our paper, it was highlighted that the so-called individual development, in terms of improving the abilities of each stakeholder group, is the most important motivation factor to all stakeholder groups (Kerschenbauer et al. 2013). Overall, it can be said that the long-term factors like “establishing a personal network” or “the opportunity to learn” shall not be underestimated in cooperation with the three stakeholder groups.

6. Limitations and Roads to Further Research

This paper outlines the motivation that lies behind the decision of representatives of students, universities and industry to collaborate in an SUI-triad. However, we are aware that our research clearly has some limitations. First, although we tried to address as many students and university related people as industry related people to participate in the survey, we failed to achieve an equal number of participants of each stakeholder group. Second, it is noteworthy that many university assistants considered themselves as students as well, which might be the reason for the rather similar results of the stakeholder groups students and university. Third, given the scope of the survey, only some industry sectors were considered. This limitation might have influenced the results.

There are indications that a successfully executed project leads to consecutive projects between a university institute and an industry partner. Consequently, not only the motivation factors for single projects should be considered in future research, but also factors that generate dissatisfaction if they are not fulfilled, e.g. payment. Future studies should focus on hygiene factors (Herzberg 1959) relevant for the specific stakeholder groups; especially as far as the maintaining of longer-lasting triadic collaboration is concerned.

Acknowledgement

The authors wish to acknowledge the help of the Austrian Association for Engineering and Business Administration during the data collection phase. Furthermore, we would like to acknowledge the helpful comments of the reviewers on an earlier draft of this paper, which was presented at the 7th International Technology, Education and Development (INTED) Conference from March 4th to 7th 2013 in Valencia, Spain.

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