

# How university-industry collaboration in mixed team creates value in the front end of innovation?

Kirsi Polvinen<sup>1</sup>, Pekka Berg<sup>2</sup>

<sup>1</sup>*Innovation Management Institute, Aalto University  
kirsi.polvinen@aalto.fi*

<sup>2</sup>*Innovation Management Institute, Aalto University  
pekka.berg@aalto.fi*

## Abstract

Companies' collaboration with external partners is increasingly important in innovation management, and collaboration with academia is a natural part of the development. This paper focuses on university-industry collaboration in the front-end of innovation, where empirical research is still limited. In this preliminary study company cases are presented in a course setting having a unique mixed team approach. Experiences of such approach from company representatives' point of view are presented in this paper as well as some promoting and preventing factors for such collaboration. According to the results of the study, choosing a suitable topic of the industry project and the role and commitment that corporate people take in the mixed team are crucial for collaboration and for a successful outcome. Main value of such university-industry collaboration for the companies is obtained through getting new ways of thinking and acting.

**Keywords:** *University-industry collaboration, mixed team, front end*

## 1 Introduction

Companies' collaboration with external partners is increasingly important in innovation management, and collaboration with academia is a natural part of that development. Empirical research about collaboration with multidisciplinary student teams especially in the fuzzy front-end of innovation process is still limited, especially from companies' point of view. In addition, current research on university-industry collaboration focuses mainly on collaborative R&D projects instead of innovation activities and doing things in new ways. This preliminary study introduces a mixed team approach for industry-academy collaboration in the front end of innovation. The unique approach is especially true in Finland whereby many companies have deep relationships with academia and they are often willing to open their environment to the students. This preliminary study brings insight about corporate peoples' experiences about mixed team approach in a course setting and its value for the companies.

## 2 Theoretical starting points

Concepts are created from ideas in the front end phase of innovation process. Empirical research about companies' collaboration with multidisciplinary student teams especially in the fuzzy front-end of innovation process is limited in the literature. In addition, current research on university-industry collaboration focuses mainly on collaborative R&D projects. In this chapter innovation process and especially front end of innovation is first introduced shortly. Then literature about university-industry collaboration is presented with an example of research concerning collaborative R&D projects. Finally some literature about visualization methods and tools is presented. They are essential in aiding communication and concept creation in collaborative team work.

### 2.1 Innovation process and front end of innovation

Effective and efficient innovation processes are in the key role in providing companies with practical means to respond systematically to emerging challenges. A variety of linear and non-linear models and formal process descriptions for managing innovation processes and activities are presented in the literature. A typical example of linear model and also the front-end phase is Cooper's State-Gate-Model [1]. An opposite process model, i.e., the non-linear and informal process model, is a new concept development model [2], [3]. Between two above mentioned extremes, there are several other process models for managing the front-end phase of the innovation process. The front-end phase of innovation process underlines the development of defined opportunities and ideas into new incremental and radical concepts, clear development requirements and a business plan aligned with the corporate strategy [4]. The front-end elements are: *The Opportunity Identification* - which identifies the opportunities (both business and technological) worth pursuing in relation to business strategies, *The Opportunity Analysis* - which translates the identified opportunities into specific business and technology opportunities, and conducts the first technology and market assessment; *The Idea Genesis* - which develops the opportunity into a concrete idea, *The Idea Selection* - which focuses on finding the most valuable ideas from the business point of view by using different selection models and tools, *The Concept and Technology Development* - which includes estimating the business potential, customer needs, investment requirements, potential competitors, technology unknowns, and the overall project risk of the idea. According to Hertenstein and Platt [5], about 75-90% of the final costs of new products have been determined at the front end phase of the innovation process. However according to many studies, the front-end phase represents the weakest and most troublesome phase of the whole innovation process, and at the same time it provides one of the greatest opportunities to improve the overall innovation capability [6], [7] and [8]. The front-end phase has a very strategic nature since important strategic decisions related to e.g. target markets, customer needs satisfaction, value propositions, expected product price and product costs, the main functionalities of products, and the predominately used technologies are all made at this stage [9] and [10]. Front-end phase of the innovation process provides good opportunities to ideate and create new concepts also with external stakeholders, academia being one of them.

### 2.2 University-industry collaboration

There is a growing world-wide trend toward greater collaboration between academia and industry. A lot of current literature about university-industry collaboration focuses to R&D projects. Barnes et al. [11] evaluate the findings of six collaborative research projects. Their research brought together the results of a thorough review of the published literature in the field of collaboration management and empirical evidence provided by six separate case studies. Objective of their research was to identify factors which, if managed correctly, increase the probability of a collaboration being perceived as successful by both academic and

industrial partners. Outcome of this research was a good practice model for successful university-industry collaborations. According to the literature [12] perceptions of realized benefit can have substantial impact on the behavior of partners throughout the collaboration. The in-depth case study research of Barnes et al. [11] yielded a number of success factors for university-industry collaboration in collaborative R&D projects. The good practice model presented as a result of their research was based on six key areas: 1) the need to evaluate new partners and build a collaborative environment, 2) good project management, 3) a tendency for collaborations to be influenced by external factors, 4) the importance of trust, commitment and continuity, 5) measures which help maintaining the interest and commitment of the industrial partners and 6) appropriate balance between academic objectives and industrial priorities. According to the findings of Barnes et al. [11] good project management is essential to success and particular emphasis should be given for example to effective communication.

### **2.3 Communication in collaboration**

One particular problem in handling complex problems is articulation. In many cases people restrict themselves into the spoken language as a means to articulation, although it has many limitations. Efficient communication in collaboration can be aided by having supplements to the spoken language. There are different tools and methods that can be used to facilitate construction of a shared understanding and to systematically develop the concept. Kristiansen et al. [13] focuses on the articulation of tacit and complex knowledge by taking outset in a specific methodology, LEGO Serious Play. The methodology viewed as a neutral language can facilitate integration between different research disciplines. Berg et al. [14] have presented an assessment model, where the objectives are divided into desired impacts, desired outputs and desired activities. Hoped for impacts are determined first and hoped for outputs after this. Relevant activities are determined finally. Several frames for visualization and development of business models, for example by Osterwalder [15] and by Shafer [16] have been presented in the literature. Several other tools and methods are also presented in the literature and new tools are introduced all the time.

## **3 Methods**

Expertise and know-how needed for effective innovation management is important for companies. This know-how includes basic concepts and terms surrounding innovation management and different phases of the innovation process as well as tools and methods for successful and efficient creative work. Collaborative Innovation Management (COINNO) course at Aalto University in Finland having mixed team approach is presented in this paper as an example of such environment to obtain such expertise. It is done during the course by linking scientific theory about innovation management and different tools and methods with practical industry projects. In this chapter mixed team approach in the COINNO course and data collection are presented in more detail.

### **3.1 Mixed team approach in the Collaborative Innovation Management (COINNO) course**

Corporate people may either work in corporate environment by solving challenges or in campus environment by doing research. They may also work as coaches of the student teams in campus environment and they may even join the team as students to solve industry projects together as in the COINNO course. In the latter case a mixed team approach is taken (figure 1.). This is a unique approach and is presented in this paper. The idea of mixed teams is especially true in Finland whereby many companies have deep relationships with academia and they are often willing to open their environment to the students.

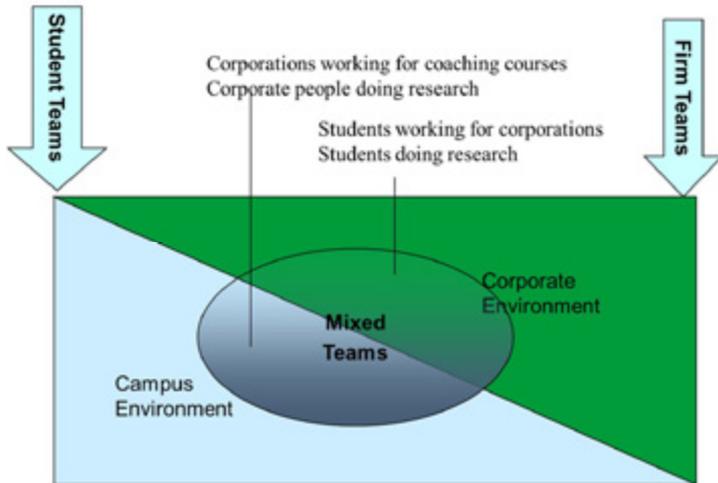


Figure1 Mixed teams approach

COINNO course is a new type of course for corporate and university students to study innovation management together in mixed teams to foster collaborative learning. It is a 2-3 months long course for up to 5 corporate projects and 20 doctoral and master's students at Aalto University in Finland. The teams are multidisciplinary having students from different cultures and backgrounds. The main teaching methods in the COINNO course are hands-on activities, group work activities, and supporting lectures. During the course students learn basic concepts and terms surrounding innovation management and different phases of the innovation process are examined. Participants also learn about idea management, foresight, creating scenarios and prototypes, conceptualizing and other tools and methods that are key to successful and efficient creative work. The tools and methods are implemented in the mixed teams when solving their industry project together. The teams engage in hands-on activities such as the building of paper or Lego structures to help visualize new ideas and to create a shared language within the team both during the lectures and between the course hours. The team work between the course sessions is facilitated with physical and virtual workspaces.

### 3.2 Data collection and analysis

Three companies attending mixed team work in the COINNO course during the spring 2013 were treated as cases in this preliminary study. All of the companies are global having operations also in Finland. Collection of data was carried out primarily through interviews with key corporate students attending the course. Three semi-structured interviews were conducted, which lasted 30 min – 1 hour each. Additional data was obtained by sending a short survey to the course participants' right after the course. Five corporate students out of six filled the survey. Questions in the semi-structured interviews related to general attitude towards university-industry collaboration in the company, expectations and personal experience of the corporate student from the mixed team approach in the COINNO-course and value of such industry-academy collaboration for the company. The survey involved questions about general experience, team process, implementation of the results and what was wished / liked in the course.

The analysis started by familiarizing with the collected data to create a holistic picture of it and to choosing the themes. After that within-case analysis was done to see how the chosen themes show and vary in each case. The main findings are presented in the following chapter.

## **4 Main findings**

The aim of this preliminary study was to shed light from companies' point of view from new ways of university-industry collaboration in innovation management related activities. Mixed team approach in the COINNO Course is presented as an example of such a new way. Main themes found from the collected data were: 1) university-industry collaboration in general (attitude, preventing and promoting factors, value for the company), 2) corporate people's personal experiences from the mixed team approach and 3) value of university-industry collaboration in mixed teams for companies. Main findings of this preliminary study are presented and discussed in the following chapters and collected in the table 1.

### **4.1 University-industry collaboration in general**

According to the collected data collaboration with universities from companies' point of view is often seen as slow and rigid. Outputs are thought to be mostly research papers instead of something concrete. Lack of time and resources for creation of new things as well as result responsibility prevent companies' collaboration with universities. There also seem to be difference between sales and technology people in collaboration with universities, the latter ones being more active. Based on this study experiences about the collaboration with universities is a good way to change the attitudes and to raise interest in the companies. Open-minded company culture, opportunities for personal development and learning and company brand promotion among university students are among the promoting factors. On the contrary to work done by consultants, collaboration with universities is expected to produce also tangible benefits in addition to valuable output for companies.

### **4.2 Corporate people's personal experiences from the mixed team approach**

Corporate people expected to learn latest theory and tools about innovation management in the COINNO course and to get inspiration and new ideas from multidisciplinary student team for companies' innovation process. In addition, new ways to improve current ways of acting without major changes were expected as a result from the course. Based on the results of this study, choosing of a suitable person from company for the course and a suitable topic for the industry project were critical factors in terms of successful experience and outcome. Commitment of corporate students affects also to the motivation of the other team members. One of the interviewed people mentioned that ability to be one the students among others was most valuable. That is a key issue in mixed team approach. One learns and gets most out of collaboration when really participating in problem solving together with other students. Corporate people attending this kind of environment should be open-minded and have enough time for participating. The industry project in turn should be understandable for the team and not very restricted. Role of corporate people is to provide enough background information about values, strategy and resources of the company. Data collected for this study revealed value of multidisciplinary student team's "tabula rasa" thinking about the case, which enabled new fresh questions and thinking during concept development. This waked also corporate students to think and act in new ways. From the course corporate people learned latest theory and tools of innovation management as well as they get to know university students and learned to collaborate with them. They found it especially useful to link scientific knowledge and tools & methods learned in the course directly to the industry project. Visualization tools have an important role in the collaboration to understand each other's ideas better. Based on the collected data Lego Serious Play (LSP) –method [13] was seen as one of the most

important ones. It helped in visualizing the challenge and it gave hand-on experience on better understanding the case. Corporate people found it also beneficial to get feedback from academy people that had worked long time with innovation management. Several academic findings were familiar on practical level, but they got definitions during the course.

#### 4.3 Value of university-industry collaboration in mixed teams for companies.

Value of university-industry collaboration for companies can be obtained from three viewpoints: Personal development and learning, recruitment purposes and for new offerings and creative practices to emerge. Main value from companies' point of view on the basis of this study was obtained by getting new ways of thinking and acting. Collaboration with university students helped corporate people to know them better for recruitment purposes. In corporate peoples' collaboration with professors and researchers' theory and practice meet each other in a fruitful way. Talking about the course in the company and presenting the results promoted new ways of thinking and action. New knowledge had been obtained in the course that can be beneficial in the company also in the future. By getting more solutions from the course to locally recognized challenge helps to get the message to other levels in the company. Methods and tools that were taught in the course were regarded very useful and certain innovation tools were brought used and studied more inside the company after the course.

Table1. Main findings of the study

	Case 1	Case 2	Case 3
<b>University-industry collaboration in general</b> <ul style="list-style-type: none"> <li>- Attitude</li> <li>- Preventing and promoting factors</li> <li>- Value for the company</li> </ul>	<ul style="list-style-type: none"> <li>- Considered very important, although is often seen as slow and rigid</li> <li>-Relates usually to R&amp;D and logistics</li> <li>-Lack of resources and result responsibility in the company prevent collaboration</li> <li>-Experience about collaboration is a way to change old attitudes</li> <li>-Value can be obtained from three viewpoints: Personal development and learning, recruitment purposes and for new offerings and creative practices to emerge</li> </ul>	<ul style="list-style-type: none"> <li>- Collaboration has been minor, possible due to lack of time and resources</li> <li>-Universities are seen mostly as consultants</li> <li>-Outputs of collaboration are thought to be mostly research papers instead of something concrete</li> <li>-Experiences about collaboration have woke up the interest</li> </ul>	<ul style="list-style-type: none"> <li>-Collaboration is appreciated</li> <li>-Collaboration is usually related to R&amp;D and technology people seem to collaborate more than sales people</li> <li>-Value can be obtained also from tangible issues in addition to monetary issues</li> <li>-Company wants to improve its image among students as a good employer and get to know the students better.</li> </ul>
<b>Corporate students' personal experiences from mixed team approach</b>	<ul style="list-style-type: none"> <li>-Collaboration with multidisciplinary student team helped to get new ideas and ways of thinking in addition to learning theory, tools and methods of innovation management</li> <li>-Best thing was to attend the course as one of the students</li> <li>-Student teams' without pre-understanding about the case enabled fresh questions and thinking</li> </ul>	<ul style="list-style-type: none"> <li>-The course was seen to be related to the process and expectations of outputs were not the same as from consultant work.</li> <li>-Aim in the industry project was to improve existing way of working without major changes and to obtain new way of thinking.</li> <li>-New knowledge was obtained from the course</li> <li>-It was fruitful to collaborate and get to know the students</li> </ul>	<ul style="list-style-type: none"> <li>-The course was a good learning experience and helped to widen the view outside the company</li> <li>-The industry project was too technical</li> </ul>
<b>Value of university-industry collaboration in mixed teams for companies</b>	<ul style="list-style-type: none"> <li>-Discussion about the course and presenting the results promoted the start of new actions and ways of thinking</li> <li>-Innovation tools have been used and studied more</li> </ul>	<ul style="list-style-type: none"> <li>-New ideas and ways of working</li> <li>-New solutions to a locally recognized challenge, which help to communicate it further in the company</li> <li>-Outputs and methods have not yet been implemented but they are kept for use in the future</li> </ul>	<ul style="list-style-type: none"> <li>-New ideas that can be used in own work</li> <li>-Discussions with colleagues about the experiences in the course</li> </ul>

## 5 Tentative managerial implications

This preliminary study gives insight about corporate peoples' experience about collaboration with university students in mixed teams in front end of innovation. Companies' collaborate with universities often in R&D related projects and not to obtain new ways of thinking and acting. Anyway, experiences of the latter one change attitudes of corporate people towards university-industry collaboration to a more positive direction. Open-minded and creative company culture, opportunities for personal development and learning and promotion of company image among the students have promoted collaboration. By experiencing university-industry collaboration in an environment, where different potential are able to meet and create something new together, promote collaboration and new ways of acting and thinking inside the companies.

## 6 Discussion

The key concern of companies' in R&D related projects is in the outcomes, the realisation of benefit from collaborative activities. When collaborating in an environment as COINNO course, tangible benefits and the process itself are also considered important. Value of such university-industry collaboration for the companies could be increased by using collective expertise and knowledge of the academic personnel, students and corporate people more effectively. Interesting topic for further studies is to compare differences in experiences and benefits for companies in industry-academy collaboration, where corporate people act either as students in the teams or as coaches of the student teams. Another topic for further studies would be to gather new knowledge about preventing and promoting factors of university-industry collaboration in innovation related issues from different countries. Research about using the tools and methods and their usefulness in different industry projects should also be continued.

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