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## Involving customers and users in university-industry collaboration

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## Involving customers and users in university-industry collaboration

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**Abstract:** High-technology firms are increasingly engaging in collaborative relationships with universities to transfer academic knowledge for industrial purposes or to jointly develop valuable new knowledge. The university-industry collaboration typically focuses on the early stages of a product development process, where new ideas and innovations are being developed. On the other hand, the interaction between the firm and its customers takes place during the commercialization of new innovations. For this reason, customer insights should be included to a greater extent in university-industry collaboration projects. Based on a case study comprising five long-term university-industry collaborations in Finland, this paper demonstrates how the involvement of end users and industrial customers in university-industry collaborations can contribute to both the early and late phases of the product development process. This paper highlights the collaboration practices involving end users and customers that facilitate the commercialization of the university-industry collaboration.

**Keywords:** Commercialization, university-industry collaboration, customer involvement; user involvement.

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### 1 Introduction

In the spirit of open innovation (Tether and Tajar, 2008; West *et al.*, 2014) technology firms are nowadays augmenting their research and development (R&D) capacity by collaborating and co-developing with other players and institutions. This trend has also stimulated the growth of university-industry collaboration (Morlacchi and Martin, 2009), and technology firms are increasingly absorbing and exploiting the results of academic research through collaborative university-industry relationships (UIRs) (Perkmann *et al.*, 2013; Ankrah and AL-Tabbaa, 2015). Consequently, the research partnerships between industrial firms and universities enable the firms to absorb new knowledge that may be critical for their R&D activities, to solve technological problems and to gain access to

critical human resources and new competences (Lee, 2011). For this reason, R&D management of technology firms seek guidance on “best practices” related to strategies and incentives as well as measuring and monitoring the commercialization of university-based innovations in technology firms, particularly those operating in knowledge-intensive high-technology areas (Phan and Siegel, 2006). However, to achieve the desired results of innovative UIR collaborations, firms must be able to commercialize the results of the collaboration (Thursby and Thursby, 2000). This has often been shown to be unexpectedly difficult. One obstacle to commercialization of the UIR collaboration results may be the fact that the UIRs form a complex set of overlapping interactions and institutions (Laursen and Salter, 2004; Siegel *et al.*, 2004) with relatively high organizational and cultural barriers (Bruneel, D’Este and Salter, 2010). Whereas the industrial firms mainly focus on utilization of short-term research that directly contributes to their R&D and product innovations, universities often act as open and social institutions that primarily focus on creating public knowledge and education (Bruneel, D’Este and Salter, 2010; Lee, 2011).

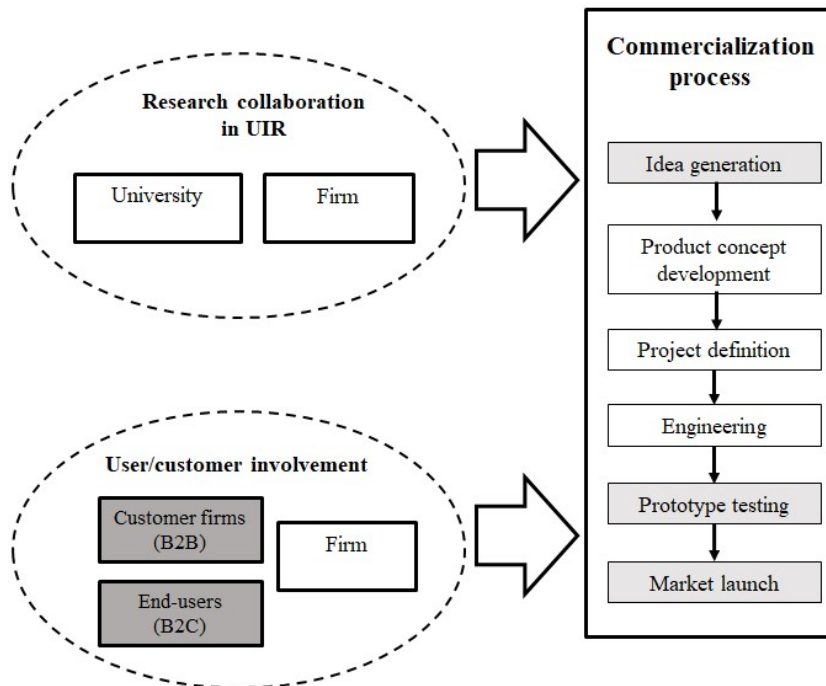
The importance of the commercialization of the results of collaboration with university research has been recognized in many academic studies in this field (Siegel *et al.*, 2004; Perkmann *et al.*, 2013; Weckowska, 2015), but few studies have actually explored what kinds of practices could facilitate this commercialization in terms of organizational learning (Weckowska, 2015). In this study, the focus of the research lies in the involvement of users and customers in UIR collaborations. Several studies have explored and highlighted the facilitating role of customer involvement in improving R&D performance and innovation (Gruner and Homburg, 2000; Un, Cuervo-Cazurra and Asakawa, 2010) in high-technology firms. However, previous research has not studied what kind of role the customers and users may play in the commercialization process of university-industry collaborations. This paper aims to address this gap seeking to answer to the following research question: *How can customer and user involvement in UIR collaboration facilitate commercialization of the collaboration results?* By seeking answers to this question, the study examines the practices related to customer and user involvement in successful UIR commercialization processes, through a multiple case study of five UIR cases in Finland. The practices related to customer involvement are examined in terms of inductive, qualitative research, which is useful in this context since it enables the researcher to analyse the organizational practices related to stakeholder collaboration based on interview data.

## **2 Background**

Acquiring new state-of-the-art knowledge for a new product development process is a central challenge for firms operating in high-technology areas. To stay ahead of their competitors in terms of innovation performance and product development outcomes, the firms must search for this knowledge outside their boundaries (Asakawa, Nakamura and Sawada, 2010). Thus, collaboration with a network of different external partners and stakeholders has become crucial, and firms are actively exploring opportunities for collaborations in relationships with external partners (Emden, Calantone and Droge, 2006). In the research collaborations carried out in UIRs (Perkmann *et al.*, 2013; Ankrah and Al-tabbaa, 2015), the industrial actors share and jointly develop new knowledge with

their university partners (Kunttu, 2017). The academic involvement in the UIR collaboration typically contributes to the early stages of industrial firms' product development processes (Gruner and Homburg, 2000), as presented in Figure 1. This is because academic involvement in industrial projects often generates new ideas, but the commercialization of the UIR innovations has traditionally been executed as an internal industrial process, not usually involving research partners. On the other hand, industrial firms often involve their customers and end users in the final stages of product development, e.g., in piloting or testing newly developed products or services (Gruner and Homburg, 2000). In this manner, customer involvement in product development usually focuses on the incremental improvement of current products, not on generating new ideas and possibilities for future products (Danneels, 2003, 2004; Un, Cuervo-Cazurra and Asakawa, 2010, p. 687). Moreover, (Gruner and Homburg, 2000) have suggested that a firm's collaboration with customers best contributes to new product success when customers and users are involved in the later stages of the product development process, especially product testing activities – stages that are directly related to commercialization (Figure 1). However, as indicated by (Gruner and Homburg, 2000), customer involvement could also potentially contribute to the earliest stages of the product development process in terms of generation of ideas, if this kind of interaction is correctly facilitated. The purpose of this paper is to investigate how customer and user interaction with industry could be combined with the academic interaction taking place in UIRs, and how these two types of interaction could jointly contribute to industrial product development and commercialization.

This paper analyzes the role of user and customer involvement in UIR collaboration and in particular their impact on the commercialization process of the outcomes of this collaboration. Since the customer relationships can be seen in two distinct ways: relationships with B2B (business-to-business) customers and direct relationships to end-users (B2C, business-to-customers), these customer relationship types are being analyzed separately. The first group of customer relationships, *customers*, includes the firms who are the industrial partner's B2B customers. Involving customers in R&D collaboration (Cohen, Nelson and Walsh, 2002) helps the collaboration partners to understand customer preferences and needs, which in turn contributes to the joint innovation process between the collaboration partners (Un, Cuervo-Cazurra and Asakawa, 2010). The second stakeholder group, *end-users* of the industrial firm's products represent the consumers, who may provide the collaboration partners valuable, experience-based knowledge on the usage of the products. Understanding the end-user expectations, needs and favors is essential for companies who provide products and services for consumers.



**Figure 1** Industrial firms' product development process. University collaboration taking place in UIRs typically contributes to the early stages of the process whereas the main focus of customer involvement lies in the final stages of the process.

### 3 Case study

To explore what kinds of organizational practices may facilitate the successful commercialization of the results obtained in the university-industry collaboration, a comparative, qualitative case study of five companies actively collaborating with universities in Finland was examined. The main data collection method in the case data acquisition was interviews, but additional secondary data such as corporate brochures and archives, Internet information and descriptions of the partnership were used. The cases for the case study were selected in a purposive manner to find long-term and close collaborative UIRs that had yielded to successful results in terms of commercialized results of the collaboration. In addition, all the selected cases, the customers or users of the industrial partner were involved in the UIR collaboration. For the case interviews, a semi-structured interview template was designed and utilized. The template focused on the commercialization process by asking the interviewees to tell about the process that yielded to successfully commercialized innovations in the UIRs they were dealing with. A special focus in the interviews was in the involvement of the industrial firms customers in the UIR. The interviewed industrial managers named their key collaborators on the university side, who were usually the leaders of research groups. This way, the most appropriate people for the selected case study were involved, such that all the respondents

were key persons in the cases representing the selected UIRs. Interviews were recorded and transcribed. To maintain confidentiality of the interview data, the analysis presented in this paper identifies the interviewees only by position.

**Table 1** Case descriptions for the studied relationships between universities and industrial partners

	<i>Case A</i>	<i>Case B</i>	<i>Case C</i>	<i>Case D</i>	<i>Case E</i>
Industrial area	Mobile devices	Telecommunications	Heating systems	IT systems for logistics	Machinery for construction and mining
Relationship age	Five years	Three years	Six years	Four years	Six years
Area of the joint R&D projects	Software and algorithms	Service products	Service products	Smart services for logistics	Service products
Stakeholder group involved in collaboration	Users	Users	Users, customers	Customers	Customers
Participants of case interview (industry)	Research Manager	Development director	R&D Director	Global program manager (R&D)	R&D Director

This paper has five cases, as summarized in Table 1. Cases A and B represent cases in which industrial firms collaborate with universities, and this collaboration has a clear and significant involvement of the firms' users (B2C). In cases D and E, the UIR collaboration involves with the firms' customers (B2B). The case C involves both users and customers.

### *Case descriptions*

In case A, a technology firm developing software for mobile devices has close collaboration with its university partner in the area of algorithm development. As user experience is very important aspect in the firm's final products, it had decided to include the user experience analysis to the scope of the joint development project. In practice, this meant that the university partner made user experience testing for the new technologies that they were jointly developing. According to the firm representatives, this kind of joint activity had brought clear additional value to the project results, and also lowered the threshold to commercialize the results of the joint development activities. In case B, a technology firm operating in the area of telecommunications made collaboration with its university partner to develop new services to its users. In this kind of service product development, the role of user experience is essential, and for this reason, the collection and analysis of user experience data of the new services was an important part of collaboration. Also case C presents a UIR collaboration case in which the partners jointly

develop new service products to the firm's end users. The collection and analysis of end user expectations and needs were examined in the beginning of the project, but also in later stage when the developed services were introduced to the users. In this case, the collaboration also involved the analysis and development of the firm's B2B partners, including retailers and service partners. In case D, the company involved some of its key customers in the pilot R&D projects which were relying on long-term research collaboration with an university partner. In this collaboration, the pilot customers tested and verified the results of the research in real circumstances. In the similar manner, case E presents a UIR in which industrial firm's key customer was involved to test and give development feedback on the innovative solutions developed in UIR.

#### **4 Results**

Analysis of interviews and secondary data revealed a number of practices for commercialization of UIR collaboration results. This chapter discusses the most prevalent practices, which have been categorized based on three central facilitators of collaboration: industrial partners' customer relationships, academic knowledge and university student work.

##### *Utilizing the industrial partner's relationships to its customers and users in UIRs*

Involving customers and users in new product development has been shown to have a clear positive impact on new product success, especially in the final stages of the product development process (Gruner and Homburg, 2000). For this reason, it may be beneficial for the industrial firms to involve their customers and users in the collaborative research process between them and their university partners (Un, Cuervo-Cazurra and Asakawa, 2010), who typically contribute to the early stages of the product development process (Markman, Siegel and Wright, 2008). The role of user involvement in UIR collaboration was analyzed in cases A, B, and C, whereas cases C, D, and E represent customer involvement in UIR research. In all these cases, the collaboration between the firm and university had been developed around a specific product or service development task, and the involvement of users or customers was selected to a key research area of the joint project. The interviewees in cases considering end-user involvement (A-C) described this in the following manner:

*Our research collaboration started some years ago as a joint research project that contributes to our consumer product development. However, quite soon we understood that it is important for the research project to collect field data from end-users to understand how the users really use our products (IND, A).*

*In our business area, the role of consumer experience is very important. Therefore, it was really good that we could use the consumer data analysis as an input in our university collaboration project that was related to service development (IND, B).*

Thus, the interview data reveals that the firms making research collaboration with universities in the area of consumer products see it important to use end-user information as input in the joint development work. The university researchers also had very positive attitude towards this kind of collaboration but they pointed out that the consumer information could be utilized even more in UIR collaboration, since the analysis of user data also provides the researchers topics for developing scientific outcomes from the collaboration:

*I feel that consumer and customer involvement fits very well to the scope of our joint development projects with industry. Our industrial partner has been very satisfied with the results of this kind of collaboration, and we as a research institute have been able to utilize the data collected from the users (UNIV, C).*

*Publishing the research results is often difficult in industrial research projects. However, user experience aspects in these projects are usually not so sensitive to the industrial partners, who often allow us to publish the results related to consumer behavior (UNIV, B).*

According to the interviews, the cases related to the user involvement in the research collaboration projects (A-C) focused on both ends of the product development projects:

*In our collaboration, we were able to obtain valuable end-user information regarding the usage of our current products as well as ideas for new features to be developed for the future products (IND, A).*

*Consumer data collected in the project contributed both to the creation and conception of new services as well as improving our current services (IND, B).*

*In the surveys executed in our university collaboration projects, we collected the user data concerning both feedback on our current products and also obtained ideas for new services to be developed (IND, C)*

Thus, the interview data indicates that when the users are involved in the UIR collaboration, the project may focus on both early stages (idea generation and conceiving) and late stages (consumer testing and market launch) of the product development process. The interviewees in cases A-C had quite coherent opinions that this is a clear benefit compared to the traditional UIR research projects that typically involve only with the early stages of the process:

*When the users are involved in university collaboration, we definitely obtain more concrete research results, which contribute directly to our consumer products (IND, A).*

*Consumer data was crucial input for our joint development work with university (IND, A).*

In the cases representing customer involvement (C, D, and E), the industrial partners involved some of their key customers to the research collaboration. The main motivation with the industrial partners in this kind of collaboration was to enable smooth commercialization of the technologies that they were developing with universities:



*Co-creation with our pilot customers is quite active in our own R&D. We have also a long tradition of making research collaboration with universities. In some projects, we have been able to combine these two things, which really helps us to implement the results of research collaboration and test them with the pilot customers (IND, D).*

*We have developed a new technological solution in our joint research project with our university partner. Now, one of our large customers has been involved in this project, and it will test the prototype in its real working environment. Our university partner also collects information on this testing and uses it for further development work (IND, E)*

Thus, the interviews in cases D and E reveal that industrial firms may facilitate the commercialization of the results of university collaboration research by adopting their customers to the final phases of the development process (Gruner and Homburg, 2000). When these “lead customers” test the prototypes together with the firm’s R&D and university researchers in real circumstances, the researchers and industrial developers may collect valuable data and feedback on the product usage. This, in turn, helps the collaboration partners to take steps for further development:

*For us, our university partner contributed our service development work by facilitating interaction with our key customer firms by e.g. interviewing the customer representatives. This has steered the development work a lot (IND, C)*

Thus, the interview data indicates that involving customer firms in university collaboration facilitates the commercialization of the joint development work by means of prototype testing and product validation. This finding is in line with the conclusions of (Gruner and Homburg, 2000), who indicated that the customers’ contribution focuses on the latest stages of the product development process. However, the interview data also showed that the customer feedback and involvement has in many cases also impact to the early phases of the process (idea generation):

*The customer firms have ideas that are related to the improvement of the products by means of new features and properties. The customer interviews made by the university partner helped us to collect and systematically utilize these inputs (IND, C)*

*Sometimes our pilot customers have innovative ideas that may initiate new R&D projects. These projects are typically carried out together with this customer and our university partner (IND, E)*

### *Combining academic knowledge with customer inputs*

One of the researchers’ key interest areas in the interviews was to understand the industrial firms’ motives to involve their users and customers in the research collaboration with universities. The industrial interviewees agreed that the main benefits for them lies in the academic competences and scientific knowledge that can be complemented with the user and customer experience knowledge that most university partners also possess:

*When we decided to involve the user experience aspects to our research project with the university scientists, the project team was extended with new researchers who were concentrating on consumer experience. They carried out the user studies related to our project, and we could utilize the results in the project (IND, A).*

*In our research project, we have utilized data collected from both users and customers. In both cases, the university researchers have been in key role, since they have had both scientific understanding and practical skills to make surveys and interviews to our users and customers. They have also analyzed the results and have made good suggestions how to use them in our product and service development (IND, C).*

Thus, the interviews highlight the importance of the multi-disciplinary capabilities of the university research teams: the university partner should be able to provide the industrial collaborate with both technological knowledge and understanding on the user or customer relations. For this reason, the universities have utilized multi-disciplinary teams in their industrial projects:

*In our research team, the main competence area is technology development. However, we have seen it beneficial to extend our teams with people with background from marketing, consumer interaction or psychology. This way, we can provide our industrial partner an optimal combination of competences for both technological and user experience understanding (UNIV, B).*

*I have seen in many previous industrial projects that pure technological understanding is not enough. For this reason, we have gained competences for e.g. marketing and management in our research team (UNIV, C).*

Whereas utilizing multi-disciplinary university research teams in the collaboration, it is also important that the industrial partners involve cross-organizational teams in the UIR collaboration:

*We found it important to involve also our marketing people and people responsible for customer relationships in this collaboration. They know the customers best, and they can help the researchers to make contacts to customers. It is also very beneficial to analyze the results of customer studies with them (IND, C).*

*Involving pilot customers in joint research projects means that we involve also our sales department to the project. This way, the university researchers get inputs from both customer, sales and R&D. I think that this is really beneficial (IND, D).*

### *Employing students and university research staff in customer interface*

Experiences on involving university students in research collaboration between industry and academia in terms of innovation and idea generation have been promising (Kunttu,

2017). In all the cases analyzed in this paper, the students have been somehow involved in the joint research project between university, industrial firm and its customers or end-users. The interviewed industrial managers underlined the role of the students in the project, particularly in collecting field data from product users (Cases A-C):

*In our joint project with university partner, the university students made excellent job when they collected field data from our product users. This way, we were able to get very valuable information on the users' opinions related to the real usage of our products, and in particular to the new features that we were developing (IND, A).*

*The university partner provided us an opportunity to use student groups to make user studies as a part of our larger collaboration project. The groups collected information from our current users and also potential new users, and we really learned a lot of user experience and expectations related to our services. I feel that these findings were one of the key result of the whole collaboration (IND, B).*

*The user studies carried out in different phases of our research project with university really steered the project targets and scope in right direction. At the end of the project, the user feedback collected by the students really helped us to understand the potential of the service products that we had developed (IND, C).*

Again, the interviewees in cases A-C felt it valuable that when working in user interface the students collected data on both early and late stages of the product development process, which confirms our earlier indication about contributing both early and late phases of the product development cycle. In case of customer involvement, the students were involved in case C, whereas in cases D and E, the university research staff was mostly involved in customer interaction:

*The students made valuable work in interviewing the customers with the university researchers (IND, C).*

Also the university partners appreciated the students' contribution in the research collaboration:

*I have employed student groups in several industrial research projects. In my experience, one of the most fruitful way of working for students is to operate in the end-user interface. This is probably due to the fact that the students can easily take the position of consumer, and they can also collect consumer information easily from their networks (UNIV, B).*

*Students are eager to contribute to the industrial projects and they are pretty good in making consumer interviews, surveys and other data collection from the field (UNIV, A)*

**Table 2** A summary of the collaborative practices

<i>Category:</i>	<i>User Involvement (Cases A, B, C)</i>	<i>Customer involvement (Cases C, D, E)</i>
1) Utilizing the industrial partner's user/customer relationships in UIRs	<ul style="list-style-type: none"> <li>- Collecting and utilizing data on the end- user experience within the UIR collaboration projects</li> <li>- Analyzing the consumer behavior aspects in terms of e.g. surveys or interviews</li> </ul>	<ul style="list-style-type: none"> <li>- Collecting and utilizing data on the customer experience within the UIR collaboration projects</li> <li>- Collecting and analysing the data from the joint development work carried out between the firm and its pilot customers</li> </ul>
2) Combining academic knowledge with customer/user inputs	<ul style="list-style-type: none"> <li>-Involving the UIR project with user experience experts having backgrounds in e.g. marketing, psychology, or management</li> </ul>	<ul style="list-style-type: none"> <li>-Involving multi-disciplinary research teams</li> <li>- Utilizing the inputs from the sales department</li> </ul>
3) Employing students and university research staff in customer interface	<ul style="list-style-type: none"> <li>-Employing university students in the field data collection</li> <li>-Utilizing the student's understanding on the consumer behavior</li> </ul>	<ul style="list-style-type: none"> <li>-Employing university students in the collection of the customer inputs in terms of interviews</li> </ul>

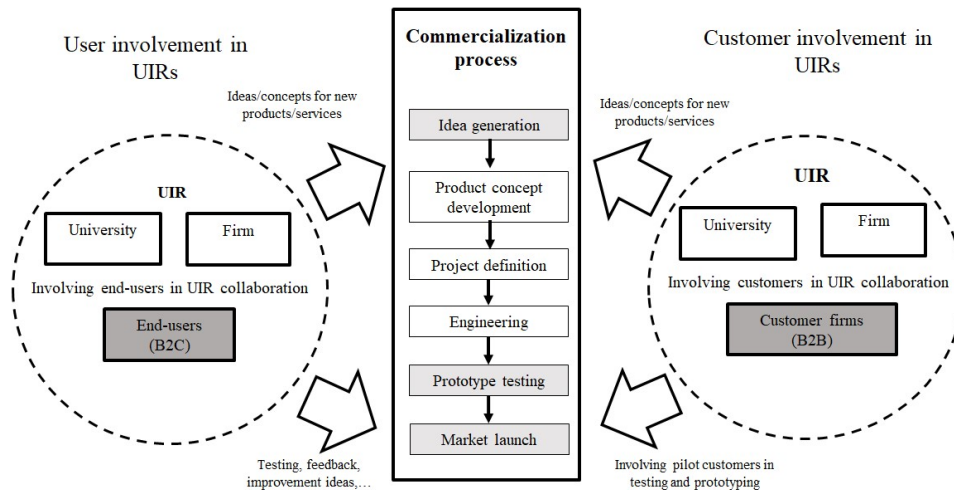
## 5 Discussion

The goal of this paper was to investigate the user and customer involvement practices that facilitate the commercialization of UIR collaboration results. In particular, the paper focused on the role of the customers and users as key stakeholders in UIR collaboration. The key practices recognized in this paper are summarized in Table 2. The main findings of the paper were the following. First, the analysis of the five UIR cases showed that involving users and customers in the joint research efforts between universities and their industrial partners clearly helps the partners to commercialize the results of their research collaboration. Involving the users and customers in the collaboration help the UIR partners extend the focus of the joint research also to the late stages, which are directly related to commercialization, as summarized in Figure 2. Second, the user and customer feedback, opinions and experiences represent very important inputs for product development and new product success, and in this sense they are also very valuable inputs for practically oriented UIR research projects. The interview data showed that involving user and customer inputs with academic research capabilities bring clear benefits to the UIR projects, thanks to multi-disciplinary capabilities of the university research teams, who can combine the scientific with understanding on the user behavior

or customer relations. Third, user and customer involvement fits well to university-industry collaboration. This is because universities have good capabilities to interact and communicate with users and customer firms, collect consumer data and make different kinds of user or consumer studies as a part of their research. The interviewed industrial managers appreciated this and agreed that this kind of interaction clearly adds the value of the UIR research collaboration between the firms and universities. The interviews also emphasized the value of university students in the collection and analysis of consumer and customer data.

## 6 Acknowledgement

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**Figure 2** Involving users and customers in commercialization process

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