R&D MANAGEMENT

# The two sides of the coin: joint project leader interaction in university-industry collaboration projects


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**This article focuses on how academic and industrial leaders view central aspects of the initiation, collaboration process, and the outcomes in government-funded R&D projects. In much previous work on university-industry collaborations (UICs), universities or researchers and/or firms have been studied without any direct reference to the other party, thus neglecting the fact that the motivations, perceptions, and actions involved in UICs are two-sided at least. In contrast, this study builds on interviews with academic-industry project leader pairs to identify how both sides perceive the initiation, interaction, conditions, and outcomes of the collaborative project. While there is unexpected overlap in both parties' perceptions of goals and utilities of the collaboration, there is also a clear tendency for academics to stress the less tangible or distant factors (e.g., 'a culture', 'priorities', or general university support), while industry actors emphasize more tangible operative factors (e.g., collaborative networks, timing issues, having project owners and conflict resolution procedures). This might illustrate different cultural or professional mores as well as different notions of what types of efficiencies to seek collaborative R&D in general.**


## 1. Introduction

Collaborative projects and centers have been shown to be important channels for knowledge transfer. Joint leadership, i.e., where one academic and one industrial project leader coordinate their efforts to manage a collaborative project, is also becoming more common, especially where funders require dual involvement from industry and academe (e.g., Thune and Gulbrandsen, 2014). Previous research shows that coordinating the leadership within such collaborative projects is challenging, especially so given the different institutional backgrounds of the parties. Differences in terms of the incentives, time horizon, and goals that govern work in the different settings affect both process and outcome. Devoting time to extra-organizational projects means reducing time spent on normal tasks, with role strain as a result (Boardman and Bozeman, 2007; Boardman and Corley, 2008). However, research indicates that leadership challenges in such hybrid arrangements can be overcome. Thune and Gulbrandsen (2014) described how U-I research partnerships evolve over time and conclude that collaborative success is related to clear participant roles; goals that align with the overall ambition of the partnership; time and resource commitments of all stakeholders; and outputs that relate to participants' own goals. In a later study, Guldbrandsen et al. (2015), found that genuine, integrative collaboration, or 'hybridization' of academic and industrial practices, occurred when goals about the aim of knowledge productions converged. Bekkers and Bodas Freitas (2008) showed that both academic and industry parties rated the knowledge transfer efficiency of such joint research projects (collaborative and contract research) high compared to other project modalities. Similarly, Ponomariov and Boardman (2010) observed that participating in university-industry collaboration (UIC) led to overall increased research productivity among academics.

Given the prevalence of funding schemes that require academic and industry parties to collaborate and share leadership, the challenges which that involve, and the possibly high reward for overcoming them, we suggest that the way project leader perceive different aspects of their joint project deserve further scrutiny. In taking stock of the observation that different perceptions about circumstances, goals, and utilities may be central to challenges arising within such collaborations, we pose the following question: how do academic and industrial project leaders, respectively, view challenges that arise during their joint project? We aim to address the question by focusing on two collaborative R&D funding schemes, and by interviewing project pairs of corresponding academic and industrial project leaders. Data collection and analysis have been structured so that information about collaboration is elicited for specific aspects of collaboration, namely initiation, interaction, conditions, and outcomes (Hellström, 2015).

In what follows, some of the literature relevant to this issue will be reviewed. Second, we will present the methods employed in the study. This section outlines the 'matched pairs' design of the study and explains the analytical process model employed in the collection and analysis of data. In the results section, we summarize the findings, focusing on the congruencies, and deviations in how university and industry partners perceive and address.

collaboration challenges. Finally, we discuss these findings from the point of view of the literature.

## 2. Overview: two sides of collaborative involvement

This literature review deals with types of UIC interaction and levels of involvement in such interactions, as well as with some of the factors identified in the literature as contributing to UIC success. Together these areas provide a useful frame for understanding the context of the present study. Research on UICs has tended to describe exchange relationships that are market-based and relatively 'hands off'. However, in contrast to the simple transfer of technologies (e.g., the buying and selling of patents, licenses, etc.), from universities to firms, participation in collaborative research projects require both academic and industrial parties to become 'relationally involved' in order for mutual benefits to materialize (Perkmann and Walsh, 2007; Weckowska, 2015). Despite the two-sidedness of a collaborative relation, much of the previous literature has focused on only one of the involved parties (e.g., Santoro and Chakrabati, 2002; Schartinger et al., 2002), and then typically the academic side (de Wit-de Vries et al., 2018, see also e.g., D'Este and Patel, 2007). An exception is McCabe et al. (2016), who explored how both parties contribute to the joint research project. Based on a large number of interviews with both researchers and industrial partners, the authors suggested a typology of three types of involvement: low, high, and deep. Low involvement denotes a relationship in which researchers are at the helm: the academic side of the partnership performs the majority of the research, while the industry side merely provides data or access to a research site. High involvement describes those relationships in which the industrial partner contributes to the practical aspects of the research, but the researchers are in charge; the division of labor in these projects tends to be lopsided, with industry partners left out of the design, analysis, and write-up of research results. Deep involvement refers to true research partnerships: those in which collaborators contribute to the entire research process on a relatively equal basis by leveraging complementary resources, with frequent meetings, feedback mechanisms, and mutual attention to communication challenges. Similarly, Cherney (2015) identified three types of industry involvement: the formal supporter, the responsive audience, and the integral partner. The contents of these categories are to a large degree similar to those proposed by McCabe et al. (2016) in that they range from the industry party being minimally involved in the research process, to participating extensively in it. In a comparison of six cases of collaborative research projects, Barneset al. (2002) offered results that exemplify what appears to be the most common situation, namely a low level of involvement, with industry partners taking on the role of a formal supporter.

Studies like McCabe et al. (2016) and Cherney (2015) have yet to be cross-fertilized with the large body of literature that focuses on factors that affect university-industry interactions and their outcome. In summary, these are factors that relate to the individual, his/her organization, and/or the surrounding environment. On the level of the individual, his/her background and organizational belonging have been found to influence both the likelihood and the success of collaboration. In particular, a large number of studies have found that the norms and values adhered to by university researchers are incongruent with those that characterize corporate culture (e.g., Schartinger et al., 2001; Corley et al., 2006; Welsh et al., 2008; Bruneel et al., 2010). Such differences are related to academic and corporate work routines, as well as to the different timeframes of academic and corporate work (Fontana et al., 2006; Locket et al., 2008; Bozeman et al., 2016). Researchers such as Tartari and Breschi (2012) and Fontana et al. (2006) have addressed the seeming incompatibility between the 'open science' of academia and proprietary approach to research and development taken by companies. The extent to which these differences are related to practical communication challenges and misconceptions or stereotypes about 'the other' should not be underestimated (Siegel et al., 2003; Locket et al., 2008; Gertner et al., 2011). The chief way of overcoming these types of difficulties seems to be to personally engage in and build an experience of collaboration (Schartinger et al., 2002; D'Este and Patel, 2007; Tödtling et al., 2009; Bruneel et al., 2010; D'Este and Perkmann, 2011). Barnes et al. (2002) pointed out that beyond general collaboration experience, previous contact with a particular partner affects the efficiency of the partnership. Both Barnes et al. (2002) and Sherwood and Covin (2008) found that trust built on shared experience is one of the most important success factors in collaboration.

On the organizational level, the availability of resources in the form of time and money has been found to be an important facilitating factor for collaboration (Arvanitis et al., 2008; Tartari and Breschi, 2012; Schofield, 2013). Both academics and industrial partners must find time to engage in the joint project and develop mutual engagement and interests (Barnes et al., 2002; Locket et al., 2008; Gertner et al., 2011). The planning and allocation of resources can actively support collaboration via functions such as a technology transfer office (TTO), or simply offer leeway for the individual researcher or employee to engage in collaboration (e.g., Van Looy et al., 2004; Debackere and Veugelers, 2005). Other organizational factors found to influence university-industry interaction include any incentive structures of the organizations involved. Such incentives may be colored by the logic to which the organizations adhere (Bruneel et al., 2010).

Last, the environment also plays a role in deciding the fate of UICs. Being physically close makes academics and industrial partners more likely to collaborate (Locket et al., 2008). However, the influence of proximity seems to be moderated by the character of the collaborators. Being close has been found to be more important for less R&D-intensive firms (Laursen et al., 2011), as well as for smaller ones (Slavtchev, 2013; Dornbusch and Neuhäusler, 2015).

## 3. Method

### 3.1. Material and design

The empirical material consists of interviews with project leaders/participants in 10 collaborative university-industry projects (20 participants in total). Two Swedish collaborative funding schemes were selected, both of which require collaboration between academic researchers and industrial partners to achieve practical-, utility-, and innovation-oriented outcomes. The first, Development Driven Innovation (UDI), is run by the Swedish Agency for Innovation Systems (Vinnova) and provides funding for up to five years of collaborative research and development intended to further solutions to grand challenges-type problems such as those found in the UN's Agenda 2030. The project consortia financed by UDI usually encompass a large number of actors, spanning not only industry and academia, but user sectors and other stakeholders. UDI projects shall 'be based on profound interaction between all actors needed for successful implementation, in particular through the active participation of users, customers and other relevant stakeholders' (Vinnova, 2020). Interaction is imperative throughout the process of ideating/initiating, developing, and testing solutions, and applicants need to specify the contributions of each project party.

The second program is a collaborative scheme (HÖG) funded by the Swedish Knowledge Foundation (KK-Stiftelsen). The aim of the program is to establish and develop new research areas, and to promote the competitiveness of participating firms. The program funds collaborative projects of between one and three years in length that deal with distinct problems identified in a university-industry partnership, usually with some direct business application in mind. The program requires at least two firms to participate in a project, but only funds the research side of the collaboration. The industry side is expected to match the resources provided by the foundation as a minimum. The projects in this study cover a spectrum of research/innovation areas, ranging from sensors to urban infrastructure, and from medical technologies to factory airflows.

The study draws on interviews with 10 'matched-pairs' from each of the 10 projects: the project leader on the academic and the industrial sides, respectively. This methodology, in which academic researchers and industry representatives working on the same project are interviewed, permits the study of contradictions, complementarities, or the placing of emphasis on different aspects of the collaboration. The matched-pairs design is not expected to generate insight on the level of the pairs as such, but rather represents a sampling strategy for maximizing the visibility and validity of typical or type-level relationships found in the material as a whole by collecting pairs from the same projects.

### 3.2. Collection and analysis

Semi-structured interviews were conducted with 20 project participants, all of whom filled a key coordinating role in their projects on either the industrial or the academic side. The interview questions were intended to capture interactions among participants related to different aspects of collaboration. For the purposes of this study, these are:

- The initiation of collaboration (actors, motivations, mechanisms involved).
- Interaction between partners (form of collaboration, structures/processes, facilitators/barriers).
- Conditions for collaboration (general framework conditions not covered in the above topics).
- Outcomes from collaboration (products, new resources, networks, new trajectories).

These categories, or aspects, are derived from the 'action-value attribution framework' (Hellström, 2015; Hansson and Polk, 2018), and summarize various insights from research on program theory, cognitive mapping, and the psychology of attribution to propose a simple model for structuring actors' attribution of value to activities and conditions. The framework focuses on how actions, events, and processes (including various framework conditions) are perceived by the actors as having been effective in generating outcomes of various kinds. Interview questions derived from this analytical framework included:

- How was collaboration initiated, and by whom? How was contact made?
- What were the most important forms of collaboration, and how were these enacted in practice?
- What were the most important types of exchange between partners?
- What has been learned from such exchanges?
- What are the most important outcomes of the project?

Interviews were coded according to the above categories following the principles of template analysis (King, 1998). The responses were analytically summarized to form an account of each of the aspects (initiation, interaction, conditions, outcomes). We present the results of this exercise below under the respective categories of the template.

## 4. Results

### 4.1. Initiation

Initiating a project requires both coming up with a feasible idea and attracting funds to execute that idea. We see two ways in which the ideas that underlie the studied projects emerged. In the first, one actor – a university researcher, an industry representative, a broker (e.g., university grant offices), or someone else who would later become a project participant – develops an idea, and then contacts people he or she believes would be suitable collaborators. Potential collaborators were typically identified in the 'ideators' network, usually among individuals or organizations with which this person had previously been in contact or even collaborated. Only rarely did the initiator make cold calls to prospective partners. In the cases in which he or she had to resort to this strategy, it was often difficult to identify relevant actors. Only university researchers reported the latter experience. The other way a project idea emerged was through the joint identification of overlapping interests and potential synergies by future project partners. This normally happened in the course of formal or informal networking (e.g., a presentation of research activities, an industry event, etc.), or discussions about other matters (e.g., another joint project). Here too, prior contact between the future collaborators was key to the emergence of the project idea.

The majority of university researchers interviewed reported having developed ideas and then reaching out to industry partners. Correspondingly, industry representatives more often talked about having been contacted by university researchers or the like, and/or a joint identification of ideas. Irrespective of how the idea emerged, both researchers and industry representatives tended to report that it had been developed and refined through discussions between parties. University researchers commonly drove the process of attracting funds to execute the idea, largely because they had prior experience in writing research grant applications.

The motivations for engaging in collaborations differed between the two categories. Two motives stood out among the university researchers interviewed; first, all spoke of the project as an opportunity to advance research. Such opportunities were often, however, only mentioned in passing. Interviewees instead tended to emphasize the possibility of seeing their research results 'do good'. Several researchers spoke of a wish to work 'outside the ivory tower' on 'socially relevant problems'. Oftentimes, working on problems of practical significance was assumed to be a way to achieve both social and academic impacts. Some university researchers also saw industry collaborations as a way to keep teaching up to date, and thereby to enhance the employability of students.

Industry representatives' main motivations for collaborating with universities were the possibility of identifying new business opportunities or increasing competitiveness. They reported they could achieve this either directly, through the development of new applications of their company's technology, or down the line, through the expansion of personal and/or organizational networks. Collaborating with university researchers was seen as a way to get an in on cutting edge research without having to carry all of the costs.

## 4.2. Interaction

Interaction between the interviewed parties took place within a more or less formalized project structure. The complexity of this structure varied with the size of the project (i.e., the number of parties involved): the bigger the project, the more complex the project structure. As an example, one of the bigger projects had a steering committee with both university and industry representatives, and several sub-groups that reported to the committee. The steering committee would, for example, handle primary issues that could not be resolved on the sub-project level. A single project manager often ran the smaller projects and this person was usually a university researcher.

Interactions between parties varied in duration and frequency. The majority of interviewees, university researchers and industry representatives alike, described staccato-like interaction over email or in relatively short but intense meetings (face-to-face or using some type of media), in which project results (e.g., prototypes, protocols, etc.), ideas, or other practical project matters were discussed. The frequency of these meetings ranged from once a week to once every six months. In projects based on this type of interaction, each party generally worked alone between meetings, without too much inter-organizational communication.

In contrast to this short but intense style of interaction, several interviewees described longer-lasting and closer forms of collaboration. Without exception, these accounts revolved around a longer stay by a person employed by a project partner. Arrangements varied; setups in which PhD students and researchers visited firms were more prevalent than the reverse (although this too occurred). One university researcher recounted, for example, how he visited the collaborating firms for weeks at a time in order to conduct measurements. This type of longer stay allowed for everyday communication and relationship-building that shorter meetings did not.

Several of the interviewees – both university researchers and industry representatives – recounted how arriving at a joint understanding of central problems and concepts had been difficult in the early days of the project. Some reported having been aware of its importance and thus dealing with it in a structured way, whereas others described it as an unintended result of discussions. One university researcher viewed acting as a translator between the other parties involved as one of his most important project tasks. Another interviewee, also a university researcher, described how he had initiated the preparation of a dictionary covering central concepts in order to facilitate interaction.

## 4.3. Conditions

Academic and industry actors converged on a number of general points regarding the conditions that supported collaboration. One of the most salient factors mentioned by respondents was that of goal convergence: having common or at least compatible goals for research, or for such goals to converge over time. The academic partners mentioned conceptual goals: for example, how technical concept testing must be of scientific as well as industrial relevance. Both academics and industry spoke of the need for complementarity in terms of substantial subject knowledge, and of R&D competencies, so that the joint effort contributes beyond what can be achieved independently. According to academic respondents, this complementarity was easier to achieve when a project focused on more general-purpose technology, or platform technologies, such that the research insights from studying and developing these could be clearly generalized to other research fields, and not simply to support one particular product. According to the academic representatives, an important condition for this was an industry partner with a strong footing and clear presence in his or her academic department. Similarly, industry partners reported that common knowledge and joint operative aims were something that developed over time between partners.

Both academics and industry partners supported the notion that goals can never be assumed to develop by themselves; they must be formulated clearly – preferably at the beginning of the project – and the extent to which project activities adhere to them must be continuously monitored. The project leader plays an important role in enabling and maintaining goal clarity. This might be especially pertinent when it comes to the industrial project leader, since otherwise the project might end up only being conducted on its academic merits, and lose industry relevance; in other words, lose its foothold with the industrial partner. A related issue was also raised by industry project partners: the challenge of handling the difference between industry's and academia's priority preferences (publishing vs. commercializing) and, closely associated with this, how to deal with results with scientific as well as commercial relevance. Even though both sides expressed concern and quoted somewhat negative experiences in this regard, no one offered any clear solutions to this classic dilemma in academic-industry collaboration.

As may be gleaned from the above, the convergence of collaborative goals requires the participants to have substantial collaborative experience. This condition is in a way obvious, since experience with something usually leads to better performance. Several participants, however, cited this factor as crucial. Academic partners pointed to a collaborative history – both with the specific partner and with other industrial partners – as a strong facilitating factor in project success. Industry partners emphasized the need for both project partners to have the extensive collaborative experience, indicating that it contributed to success. Academic participants also stressed that the project leader must understand 'both sides', and that this experience comes from previous collaborations, or from having actually worked in both environments for a duration of time; for example, by having 'jumped over' to the 'other side' at some point in one's career. One factor mentioned in this regard was the benefit of having an industrial project leader with previous experience as an academic researcher, and not just as a collaborative partner. According to the academics, collaborative experience could manifest on a more overarching level as a 'culture of collaboration' in the academic research environment; a result of having long-term involvement with one or several industry partners, and having evolved the department's academic mission in close collaboration with those partners. Industry representatives expressed this more loosely as having 'strong collaborative networks' with academic actors.

Some respondents emphasized how, over time, collaborative experience can develop into like-mindedness among the partners. Such like-mindedness was considered a powerful factor in support of collaboration, and a way of bypassing negotiation and possible misunderstanding regarding goals and expectations. From industry's perspective, this involved understanding the other side's time horizons; for example, how development and product introduction life cycles create demands on the timing of the project cycle. From academia's side, this was associated with the way in which firms of various types and sizes were different in terms of collaboration. As an example, several respondents mentioned how small firms were often able to involve themselves in research projects almost as if they were research units themselves; in other words, small size enabled closer ties. In both cases, mutual appreciation and understanding were cited as critical factors.

A final condition that must be mentioned is the presence of organizational support structures for collaboration. Academic representatives mentioned central coordinating (administrative) units as beneficial to functioning collaboration, especially when such units could help with contracts, financial issues, and Intellectual Property Rights (IPR) concerns. Industry instead mentioned the benefits of organizational solutions for managing possible conflicts, such as steering groups, and having clearly designated internal 'owners' of the project, on the academic as well as on the industry side.

### *4.4. Outcomes*

The most salient type of outcome mentioned by the respondents related to the creation of new knowledge. This is perhaps not surprising given that the focal activity was a research project, but the variation in terms of what counted as new knowledge or insight was significant. Typically, academics emphasized how the collaboration had opened up new research discussions and thereby created new perspectives on existing knowledge. Collaboration with industry partners led to a deeper understanding of what was already being researched. Industry, in turn, tended to emphasize how interactions with the academic researchers gave them the knowledge to pursue similar projects by themselves and with other researchers; that is, it provided a sort of knowledge platform for further inquiry. Industry representatives, for example, could utilize academic knowledge to argue for new ways of working 'at home'.

 

More commonly, a tangible knowledge outcome as far as industry was concerned related to products and services. One such outcome was new knowledge about the technical demands of user communities, for instance, doctors and medical researchers' requirements for diagnostic equipment, and practical testing of such equipment. Outcomes also involved early awareness of regulatory issues encountered as a result of broader engagement in research networks. Sometimes, the outcome was of a clearly dual-use character – such as an approach to structuring problems – in that it could be academically oriented, but also used by the firm for their processes.

On a few occasions, academics reported that new research directions had opened up as a result of industry project collaborations, that is, the researcher had been able to thematically redirect his or her research in a positive way as a result of the project. As such, learning to master the collaborative project format offers the opportunity to acquire new types of funding (premised on collaboration), and offers the researcher a new role in the academic setting: that of coordinator of collaboration. The corollary to the redirection on the industry side was the development of new technology and solutions. This occurred as a consequence of new research results that revealed some new, relevant functionality, or when the acquisition of research-derived IPRs enabled new development trajectories. Outcomes could also relate to product improvements, with, typically, the emergence of a general solution that solved one or several problems in an existing product or service offering. A related effect of this kind of industry outcome was that of the validation of technology. In these situations, the joint use of industry technologies by the project partners amounted to a kind of reality check for these technologies and exposed shortcomings in their use.

Access to testing infrastructures also figured among the outcomes. For example, academics mentioned the help they received from industry partners in gaining access to infrastructure and personnel for building testing equipment, and how in return they provided the industry with know-how on the technologies. Industry environments were also made available to researchers to conduct tests in the field, such as in a production facility to test research hypotheses. The above outcomes relate to effects on the substantial content of work, i.e., research topics and the way research work is carried out. In addition to these, some more intermediary-type outputs were identified related to collaboration. Academics mentioned new project initiation as one typical result of joint project work, for example, where a new project is developed and applied for in partnership with the industry partner. Industry talked about this in terms of new research collaborations that resulted from the partnership, and that ensued after project termination, or in parallel with ongoing projects. One example of this was the creation of a national university-industry consortium for the field in question, which was created after project termination. A related benefit mentioned was the practical experience of collaboration with partners, which enabled the firm to position itself in relation to different universities, depending on its specific needs.

## 5. Discussion and conclusions

In contrast to findings by researchers such as Barnes et al. (2002), we observed a substantial two-sided involvement between academia and industry. Typically, we saw a mix of the different interaction modes described by McCabe et al. (2016) and Cherney (2015). By dividing the accounts of the interactions into initiation, interactions, conditions, and outcomes, it was possible to identify how this mix was distributed across the various aspects of the projects, as well as where the points of tension or obstacles to integration were located.

To begin with, industry and academia were quite consonant in terms of how the initiation of projects came about. Both sides reported two main approaches: in the first, an actor develops an idea, and then identifies collaborators in a network. In the second, ideas are developed and refined through discussions between the parties, typically after a researcher has initiated contact with the industry, or the two parties have met via some other mechanism (e.g., an event, forum or similar occasion). These findings suggest high to deep involvement between the actors in the initiation phase (McCabe et al., 2016).

The actors' motives for initiating a joint project, however, tended to diverge. Academics gave reasons such as advancing research, being able to pursue relevant problems, and keeping teaching up to date. Industry on the other hand seemed to seek insight into cutting-edge research and business opportunities, thereby increasing their competitiveness (e.g., through the development of new applications, or increasing their available competencies through the new networks). This is not surprising, given previous work by researchers such as Bruneel et al. (2010) and Tartari and Breschi (2012) on variations in goals and norms across the two communities. It is notable that while both groups emphasized being on the research frontline as a driver, they also expected utilities from collaboration that were tangible in different ways. Academics wanted to explore areas typically unavailable to them and enrich teaching, while industry sought new products and competences. This suggests that in constructing or incentivizing collaborative projects in the initiating phase, one must be attentive to the parties' differing expectations of utilities from such collaborations, with these typically based on the institutional expectations of their respective activities and corresponding role positions (Van Looy et al., 2004; Boardman and Bozeman, 2007).

The form and content of interaction were also described quite coherently. Both sides of the collaboration emphasized project size, and how larger size increased complexity in terms of the need for coordination. A need to work actively toward a common understanding in terms of shared concepts and aims was emphasized, regardless of project size. This is consonant with previous findings by scholars such as Boardman and Corley (2008), Locket et al. (2008), and Debackere and Veugelers (2005), who emphasized the time aspect regarding trade-offs between different types of collaboration, joint engagement, and organizational coordination, respectively. In addition, it was interesting to note that both parties described the interaction as taking essentially two forms: one that was fast-paced, with short regular meetings for mutual briefings and decisions on direction, and another more long-term and immersive, in which the parties interacted continuously over a longer period. Both these types of interactions were mentioned by each side as being important to collaborative success, which suggests that the possibility of proximity as a driver for collaboration (cf. Locket et al., 2008).

The industrial and academic representatives converged on a number of points regarding conditions and requirements for successful interaction. They tended, however, to view these aspects a bit differently. Both emphasized the need for the parties to converge on project goals, and the academics specifically tended to underscore conceptual goal convergence. Both sides emphasized goal clarity as this pertained to the formulation and handling of results emanating from the project (Tartari and Breschi, 2012; Thune and Gulbrandsen, 2014). Both mentioned collaborative experience, but typically the academic side emphasized the development of a culture of collaboration, while industry talked about building up a collaborative network (see Arvanitis et al., 2008). Like-mindedness was emphasized by both academics and industry, though in different ways. The academics stressed the need to develop an understanding of how industrial priorities affect collaboration, while the industry side pointed to the need to develop a mutual perspective on the divergent time-logics involved in science and industry (cf. Boardman and Bozeman, 2007; Locket et al., 2008; Bozeman et al., 2016). Finally, both parties stressed the need for organizational support structures, but while the academic side focused on the central university coordination of projects, industry pointed to the benefits of internal 'owners' of the project who could anchor it in both organizations, as well as structures to handle conflicts during the project.

Finally, there was a great deal of divergence in the statements regarding observed and valued outcomes from the collaborative projects. Both sides perceived new knowledge as being a valuable result from the projects, but while the academics simply emphasized new perspectives on existing knowledge and new directions for research, the industry side listed a number of more tangible knowledge outcomes. These included knowledge to pursue similar projects, new ways of working, knowledge of regulatory issues and of user demands, and new IPRs and technology validation. Academia offered one similarly tangible outcome – access to research infrastructure – but again, this was more a means to an uncertain end than an end in itself. Both parties mentioned new project initiation (academics) or new collaborations (industry) as valued outcomes, findings that are broadly in line with Al-Tabbaa and Ankrah (2016).

In summary, we note that while there are many similarities in how academic and industrial project leaders perceive aspects of their joint projects, there are also significant differences. Generally, there was a tendency for the academics to put the stress on the less tangible or more distant aspects of the projects, regarding motivation, facilitation, and outcomes (e.g., new concepts, 'a culture', 'priorities', or general university support), while industry actors emphasized more tangible operative factors (e.g., collaborative networks, timing issues, and the need for project owners and conflict resolution procedures). This might illustrate different cultural or professional mores (e.g., Bruneel et al., 2010), as well as different notions of what types of efficiencies to seek in project work in general. The trend here seems to be that academic project leaders valued/identified intangible and indirect outcomes, while industrial project leaders emphasized tangible and direct outcomes. This might be related to the divergent aims of the parties (knowledge creation and profit) and/or with how they justified the value of their participation on the home front. These results are not only of interest for understanding the general relationship between industry and academe in research, but specifically also for how to incentivize and govern publically funded collaborative research projects of the type investigated here. It is also highly relevant to the individuals tasked with project leadership in such contexts, since the span in goal formulation, incentives, and time-frames among partners must be both directly and indirectly addressed by project leadership. In the first case through, for example, the enunciation of instructions and expectations, and in the second case in creating routines and procedures for interaction and communication in the project.

## Acknowledgment

This research has received support from Growth Analysis the Swedish Foundation for Humanities and Social Sciences, grant number FSK15-0881:1.

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