TITLE

Examining University-Industry interactions from the perspective of relationship marketing and business networks

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ABSTRACT

In order to be competitive in their target markets, companies need to secure an adequate level of innovation in their products, services and processes. The development of innovative solutions can be achieved through the combination of activities performed by the company and research collaborations with other institutions, and thus companies located in specific positions of interorganizational networks that include research institutions may be better positioned to access tacit and strategic knowledge (and other resources) that can help foster innovation.
The literature on University-Industry Links (UIL) has shown how universities can be valued partners for companies' research activities leading to an increase in radical innovation as well as lower R&D expenses for both parties.
In recent decades, scholars researching UIL have focused extensively on the issue and processes of transferring technology but have not yet done a great deal of research into the relational aspects of innovation between the actors involved, as well as their activities, and thus a comprehensive approach to the relationship established between those partners is lacking.
In light of the above considerations, this paper addresses this research gap on UIL looking simultaneously at the contribution of two major research streams: the Actors-Resources-Activities (ARA) Model and the Commitment-Trust Theory. In both research backgrounds, Cooperation assumes a central role and, as a result, can be used as the link between the two theories.

This paper therefore uses both the Commitment-Trust Theory and the ARA model to examine the following research questions: i) How may the configuration of the network influence the nature and type of cooperation between partners in terms of strategic resource acquisition?; ii) How may the level of trust and commitment influence the cooperation between partners in terms of strategic resource acquisition?; iii) How may the nature and type of cooperation between partners in terms of strategic resource acquisition impact the development of innovative products and services?

To explore the relationships depicted in our research questions we will follow a qualitative approach using interviews with relevant individuals from both universities and companies.
This paper aims to shed some light on the importance of trust and commitment, combined with the structural positioning of actors, as enablers of innovation in University-Industry cooperation, particularly in collaborative R&D activities. Together with the structural positioning of actors, these variables have not been tested as enablers of innovation in the context of interorganizational networks involving universities and companies.

KEYWORDS
Interorganizational networks; ARA-model; relationship marketing; relational resources; university-industry links; cooperative innovation

[X] Work in progress paper [ ] Competitive paper

INTRODUCTION

In a global economy, and to be competitive in their target markets, companies need to access reliable knowledge sources in order to systematically incorporate innovation into their products, services and processes. The need for innovation to promote competitiveness has been shown in the literature (Clark & Guy 1998, p.38).

The development of innovative solutions can be achieved through the combination of activities performed by the company and research collaborations with other institutions, as "sources of innovation (…) are commonly found in the interstices between firms, universities, research laboratories, suppliers and customers" (Powell et al. 1996, p.118). Thus, companies located in interorganizational networks that include research institutions are well positioned to acquire knowledge and other resources that can help stimulate innovation. It is important to notice that although all industries need to incorporate new knowledge into their product and organizational processes this requirement is particularly relevant for most fast-paced and knowledge-intensive companies (Gertler & Levitte 2005, p.488), such as those operating in high-value based activities as the case of biological sciences.
The capacity to innovate is not only dependent on the internal capabilities of a company, such as its research and development skills and the capacity to absorb external knowledge (Cohen & Levinthal 1990, p.148), but also on "networking and knowledge exchange between clients, suppliers, universities, etc…" (Ouimet et al. 2004, p.1), as accessing heterogeneous resources in interorganizational networks can lead to greater innovation (Gilsing & Nooteboom 2005, p.179).

The literature on University-Industry Links (UIL) has shown how universities can be valued partners for companies' research activities, as they are usually neither competing counterparts nor involved in the conflicts of interest which are typical of industrial cooperation (Santoro & Betts 2002, p.42). Moreover, collaboration with universities has been shown to lead to more advanced / radical innovations, as opposed to incremental innovations seen in industrial partnerships (Tödtling et al. 2009, p.69). The former alliances are based on the research of basic sciences, associated with the discovery of fundamental knowledge, while the latter are mainly focused on applied research and experimental development. Thus, the combination of heterogeneous sources of knowledge, as is the case of academic fundamental research and industrial applied research, particularly in the field of biological sciences, can lead to an increase in radical innovation as well as lower R&D expenses for both parties (George et al. 2002, p.599).

In recent decades, scholars researching U-IL have focused extensively on technology transfer processes, such as licensing, transference of technology and patenting (Agrawal 2001, pp.297–9). Several studies have shown the relevance of transferring knowledge, both explicitly and implicitly (namely through spillovers), to generate the innovation that companies urgently need to maintain their competitive advantage against their competitors (Lehrer 2007; Powell et al. 1996; Rosiello 2007). Concurrently, the literature on science parks and incubators has focused extensively on the process of transferring knowledge and technology from universities to entrepreneurial start-ups, namely new technology based firms (NTBFs), resulting in "substantial growth in the incidence and scope of university-industry relationships" (Poyago-Theotoky et al. 2002, p.8).
These lines of research clarified many of the initial questions and led Landry, Amara and Lamari (2002, p. 683) to advocate the importance of a social interaction when combining strategic resources. However, to the best of our knowledge, the body of literature on UIL has

not yet focused extensively on the relational aspects of innovation between the actors involved, or on their activities, and thus a comprehensive approach to the relationship established between those partners is lacking. It should be noted that the relational approach of this study does not focus on the creation of new firms but rather on the collaborative opportunities in R&D activities that both established companies and university research centres could take advantage of in order to reap mutual benefits.
Within the literature of business networks, Häkansson and Snehota (1995, p. 5) also identified the need of "models, descriptive, explanatory or normative, that embrace relationships and connections between relationships", as well as the study of "processes that form the relationships, and that capture the consequences of their connectedness". This realization, within the IMP group research, has generated much study of business relationships and led Håkansson and Ford (2002, p. 134) to acknowledge relationships as opportunities to influence and to be influenced, through network interactions. This interdependence embedded in interorganizational networks is still a subject of interest in current research (Gebrekidan & Awuah 2002, p.683) and cannot "be understood without reference to the relationship of which it is a part. Similarly, no one relationship can be understood without reference to the wider network." (Håkansson & Ford 2002, p.134)". Therefore, this research aims at understanding how the (structural) configuration of the wider network can influence the relationships (through cooperation) between partners, especially when it comes to the exchange / acquisition of strategic resources in collaborative R&D activities.

Concomitantly, as relationships are both mutually demanding and mutually rewarding (Håkansson & Snehota 1995, p.25), their development "is never determined unilaterally", despite the power or commitment of each actor (Håkansson & Ford 2002, p.137). Actors are involved in the development of each aspect of the relationship and the relationship itself "requires mutual orientation and commitment over time, assuming a high degree of interdependence" (Håkansson & Snehota 1995, p.25). In order to properly develop the relationship, and thus take advantage of each other's resources, actors need to develop an interactive social system that enables them to benefit from cooperation. We postulate that this interactive social system might be based on Morgan and Hunt's (1994) commitment-trust theory, requiring both partners to develop trust and commitment to each other's actions in order to exchange / acquire strategic resources. The levels of trust and commitment have not yet been considered in the UIL literature, although they have been recently proposed by some authors in the IMP research stream (De Wever et al. 2005; Lenney & Easton 2009). Moreover, traditionally this theory relies predominantly in a dyadic context. This study goes further by examining these variables in a broad interaction context, as is the case of University-Industry networks.

In light of the above considerations, this paper addresses the research gap on UIL looking simultaneously at the contribution of two major research streams: the actors-resources-activities (ARA) model, developed by Häkansson and Johanson (1992), and the commitment-trust theory, proposed by Morgan and Hunt (1994), within the relationship marketing framework. In both research backgrounds, cooperation assumes a central role and, as a result, can be used as the link between the two theories.
Taking into account the increasing importance of R&D cooperation between university research centers and companies, this study tries to understand how the structural positioning of actors as well as the levels of trust and commitment impact the exchange of resources in shared R&D activities. Thus, this paper aims at examining the following research questions: i) How may the configuration of the network influence the nature and type of cooperation

between partners in terms of strategic resource acquisition?; ii) How may the level of trust and commitment influence the cooperation between partners in terms of strategic resource acquisition?; iii) How may the nature and type of cooperation between partners in terms of strategic resource acquisition impact the development of innovative products and services?

The rest of the paper will be structured as follows: we start with a literature review of the interorganizational network theory, namely the contribution of the IMP group over the last three decades, and an overview of the commitment-trust theory. The commonalities between theories, which we will explore in our research, will be presented as they arise. We then present our proposed qualitative methodology and conclude with our expected contributions for theory and practice, as well as limitations and future research opportunities.

LITERATURE REVIEW

Cooperation between universities and the industry has been researched in many fields of knowledge and different and useful contributions have been made. However, this paper will focus on trying to converge two areas that have positively contributed to the discussion: interorganizational network research, mainly concerning the advances of the ARA-model, and the relationship marketing framework, in particular related to the commitment-trust theory.

The realization that the business landscape is not one of "individual and isolated transactions between companies" (Håkansson & Ford 2002, p.133) is a good starting point for the development of relationships. According to the work of Blois (1972, cited in Håkansson & Snehota 1995, p.25), the "interaction between companies over time creates the type of quasi-organization that can be labelled a relationship" and the conjunction of many of these relationships evolve into a network of related actors where the content of each relationship is capable of affecting (often substantially) all other relationships (Håkansson & Ford 2002, pp.134–7).

The ARA-model was developed from the substance and function of these relationships, acknowledging the existence of three layers that involve the relationship and its outcomes: the actors, the activities and the resources (Håkansson & Snehota 1995, p.26). The ARA-model and the IMP research stream assume a structural and relational implication of actors when co-existing in the same network (Ford et al. 2008; Baraldi et al. 2006) and those implications are reflected in the actor bonds, activity links and resource ties. The presence within these networks of relationships enables actors to "cooperate, share knowledge, become more flexible and develop together" (Baraldi et al. 2012, p.123) their competitive advantages. Unlike a more transactional view of the market, within the interorganizational networks, in particular within the ARA-model, relationships are viewed as resources that can be combined through networks of connected actors in order to gain their competitive advantage (relational view of resources in Lavie, 2006, p. 642). Investment in relational resources must be maintained in order to keep the competitive benefit, and actors therefore need to promote their own relationships (Håkansson & Snehota 1995, p.319). As Anderson, Häkansson and Johanson (1994, p. 1) advocated, any organization needs others to develop a sustainable activity and, through interaction, partners achieve cooperation, knowledge sharing and mutual development (Håkansson & Snehota 1995). In fact, within the IMP research stream, these relational activities have shown to be key for strategy formulation (Baraldi et al. 2006).

By considering the dependence of actors towards their transactional environment (other firms, other research centres, policy makers, and so on), this study should be able to design a network strategy for involved actors based on the understanding of the broader impact of each individual relationship.

As mentioned in the introduction, the contents of the relationships have not been properly addressed within the ARA framework, despite the recognition that the "content of a particular relationship can be used by the counterparts to affect their organization" (Ford et al. 2008, p.14). It is important to notice that the structural positioning of actors in the network assumes that relationships affect each other (Håkansson & Ford 2002, p.137) and these variables should therefore be addressed within the same approach. These observations imply that the unique content of relationships is as important as all other resources available in the network, because the relationship enables partners "to produce something that neither of the two can produce in isolation and something that cannot easily be duplicated" (Håkansson & Snehota 1995, p.25). The content of the relationship empowers partners "to cope with their increasing technological dependence on others" (Håkansson & Ford 2002, p.133) while remaining in control of their own resources and those shared through the network (Baraldi & Strömsten 2009, p.551). Moreover, it has been recognized in the literature that the relationship content may change between industries, as the content includes the nature of what is being exchanged as well as the information to govern the exchange process (Gilsing & Nooteboom 2005, p.180). In our opinion, this argument is crucial for the examining and understanding of university-industry interactions, since companies and universities can hardly be considered to be part of the same industry. Nonetheless, determining the relational specificities of actors within the same research domain (e.g. the biological sciences) could lead to successful cooperation and efficient sharing of strategic resources in the future, namely in R&D cooperation.

Scholars have studied how the differences between companies and universities affect their shared experiences. George et al. (2002, p.582) highlighted that "incompatibilities between cultures, such as secrecy vs. free dissemination of knowledge, can be a stumbling block to university–industry alliances". Alongside, Plewa & Quester (2007) have shown that organizational compatibility between universities and companies has a significant and direct impact on the development of trust, commitment and integration. Considering these evidences are crucial to establish successful cooperation, and assuming that companies and university research centres (URCs) have different organizational objectives, it is possible to deal with these misalignments through direct involvement "in order to monitor and shape operational routines and to reduce cognitive distance" (Rosiello 2007, p.802). In the specific case of R&D activities, these considerations should assume a central role as research, fundamental or industrial oriented, is a very costly and a very risky activity. Universities (through their research centres) on one hand, need to share with companies the inherent costs of their activities in order to survive, particularly when considering in recent years the context of cuts of the public budget for R&D funding, a trend present in many European countries (European University Association 2012). On the other hand, companies need to foster increased interaction with research centres to produce cutting edge innovation in new products and services.
In the past decades, science parks and university incubators have accumulated much of these R&D activities between firms and academia (Lu & Etzkowitz 2008, p.6), where regional spillovers account for part of the knowledge transfer process. However, the geographically localized experience between these institutions is becoming less prominent as companies try to find academic partners that best align with their R&D projects and interests despite their

location (Rosiello 2007, p.805), thus considering but not giving to much importance to regional spillovers. Concurrently, science parks have commonly been occupied by companies born out of research conducted at universities (Poyago-Theotoky et al. 2002), thus facilitating the alignment of interests. These NTBFs usually understand and are efficient in profiting from university fundamental and applied research. However, there are a plethora of other companies that need to access new knowledge and expertise to develop innovative products and services. The capacity to assimilate the know-how produced at universities may not be so developed in these companies, however that capacity "can be built through cooperative agreements with science institutions", thus "implying a higher probability of industry–science cooperation" success in R&D activities (Veugelers & Cassiman 2005, p.362). This is particularly relevant even considering the inherent differences between organizations.

It is our opinion that, considering the risk and learning realities presented above, it is almost inevitable that both actors should cooperate. Nonetheless, the literature has shown that effective cooperation has two key relational requirements: trust and commitment (Morgan & Hunt 1994). To the best of our knowledge, despite their presence in many marketing relationship studies these two variables have not been properly integrated in a common theoretical framework developed by the IMP group, in a way that promotes the interactions and relationships between actors, the same way as it does with Relationship Marketing. Since these two variables are antecedents of successful cooperation (Morgan & Hunt 1994), we wonder why they were not modelled into the actor bonds. This can be justified by the fact that IMP researchers often consider the construct of cooperation in their works. We advocate that a common framework of analysis should be developed.

As an example, Finch, Wagner and Hynes (2010, pp. 1019–21), while studying the concepts within the ARA model, argue that trust is a "cognitive and heuristic dimension of action, distinct from resources, actor-bonds and social capital". They postulate that trust (particularly in its fragile form) is key for the recognition of one's vulnerability when acquiring and mobilizing resources in a network, since this is an activity of strategic importance for successful cooperation. Similarly, Lenney and Easton (2009, p. 555) recently proposed a change to the ARA-model in order to accommodate an extra concept: commitments; the authors defined 'commitments' as "agreements between two or more social actors to carry out future actions" and explicitly distinguished it from the commitment present in relationships, acknowledging that its similarities are only marginal. While recognizing commitments to be a component of actor bonds, they placed it at the same level as Actors, Resources and Activities. Like Håkansson (2009), we feel that differences between these concepts are not as deep as the authors argue, but they did indeed demonstrate that commitment is present in many of actors' activities, and should therefore be accommodated into the modelling of actor bonds.

With these considerations in mind, we propose to integrate trust and commitment into a model inspired on the ARA-model, which aims to understand the importance and the impact of the structural positioning of actors and the existence of trustful and committed relationships between them in the acquisition / sharing of strategic resources as well as the significance of those resources in the development of innovate products and services. Our conceptualization of trust and commitment will follow Morgan and Hunt's (1994) commitment-trust theory, but we will consider other levels of analysis within those constructs to deep understand their influence as innovation enablers in UIL. The importance of trust and commitment has been recently acknowledged within the UIL literature (Mora-Valentin et al.

2004; Plewa et al. 2005) but we believe that the inclusion of different levels of analysis will further explain the descriptive power of these variables as innovation enablers.

METHODOLOGY

We propose to study the cooperation within interorganizational networks of universities and companies within a common scientific background, such as the biological sciences. The choice of this domain is justifiable considering how fast paced and knowledge intensive companies have to be in order to remain competitive, suggesting the need for increasing interactions between URCs and companies. Basically, this research aims at studying how the configuration of the actors might take place in such a network and how that structural positioning, as well as actors' levels of trust and commitment, might affect the cooperation between them, namely the propensity to share / acquire strategic resources in R&D activities.

Relationship marketing and business network theories have not yet focused extensively on connections between organizations from different sectors, such as universities and companies (Plewa 2005, p.53). The review of both areas of the literature has highlighted the opportunities for synergy between theories and this paper proposes to examine university-industry links (UIL) combining those two theoretical backgrounds. As expected, the conjugation of variables from both frameworks is not yet adequately described in the literature, to the best of our knowledge, thus requiring some exploratory approach.

It is worthwhile to emphasize that, as in other similar sectors beyond the biological sciences "firms live with complexity, ambiguity, chaos, uncertainty, fuzzy boundaries and continuous change in both technology and the marketplace" (Gummesson 2003, p.483). Although at a different level, many of these difficulties can also be reflected in the UI relational context. Consistent with relevant literature (Plewa et al. 2005) this study will be mainly qualitative. The choice of this approach relates to the fact that surveys "do not penetrate complex and ambiguous issues (they only touch some spots on the tip of the iceberg)" (adapted from Gummesson 2003, p.487). Therefore, the qualitative methodologies are better tailored to understand this reality. More specifically, interviews to relevant actors enable to understand and detail complex processes.
While trust and commitment can often be considered as easily measurable due to the existent measurement scales (see for instance Morgan and Hunt, 1994) that may not be true for the network relationships here studied. The lack of substantial support on the literature for network relationships justifies the choice of interpretive methodologies (Geiger & Turley 2003). Interestingly, consistent with the IMP research stream, these methods can help to "unravel and understand the details of how strategies are formed and emerge in a network context" (Baraldi et al. 2006, p.17). So far, we have only what Gummesson (2003) described as a 'pre-understanding' of the reality, result of the literature review, and the interpretive methodology should be able to improve our understanding of this phenomena, sorting out ambiguity and isolated events.

Thus, to explore the relationships depicted in our research questions and to refine our proposed framework in the context of UIL, we will conduct a series of in-depth face-to-face interviews with relevant individuals from both research centres at public funded universities and private companies who have shared positive cooperative experiences. Potential interviewees will be identified using three methods, namely: 1) a search of national grants

publications between academic and business partners; 2) contacts with industrial associations within the biological sciences; and 3) snowball sampling.
Interviews will follow a semi-structured procedure developed from the literature review, establishing a guideline for all interviews to be comparable while still giving the interviewee the capability to describe his/her reality free from constraints with regard to each question. Interviews will be asked to (1) describe the processes that led them to cooperate in R&D activities; (2) detail the development of trust and commitment with their main partners; (3) distinguish the level of trust and commitment with different partners in other organizations, (4) identify the strategic resources (supplied and received) that enhanced the relationship; as well as (5) comment on the indicators that produce a positive outcome in R&D cooperation.
The data of the interviews will be analysed using a qualitative research oriented software package (NVivo, for instance) and the responses from each side of a relationship will be analysed for quality of response alignment.

Restricted to the Portuguese reality of companies and research centres in the field of biological sciences, this research design will give us in-depth perception of the relationships between our variables and clues to understand the role of each actor in the activities that lead to cooperative innovation.

MAIN CONTRIBUTION & MANAGERIAL IMPLICATIONS

Research Centres in general, and those related with biological sciences in particular, have growing needs of additional funding sources due to increasing budget cuts in research and development. This trend is clearly visible in many European universities over the past years (European University Association 2012). It is argued that collaboration with the industry is an option to overcome this problem (Plewa & Quester 2007).
In order to better understand the opportunities within UIL, this research aims to shed some light on the importance of trust and commitment, combined with the structural positioning of actors, as enablers of innovation in University-Industry cooperation, particularly in collaborative R&D activities. The impact of trust and commitment in UIL has been previously reported in the literature by numerous authors (see for instance: Mora-Valentin et al. 2004; Plewa et al. 2005; Rampersad et al. 2010; Gaskill et al. 2003). However, the structural positioning of actors associated with access to key relational resources have not been analysed as enablers of innovation in the context of interorganizational networks. Thus, examining the positioning of actors, as well as their level of trust and commitment, in interorganizational networks, may contribute significantly to the research within the IMP Group. Specifically, this study aims at: (1) providing a better understanding of how relational and intellectual resources flow in U-I networks, (2) determining the impact of the levels of trust and commitment on R&D cooperation (and how those variables affect resource sharing), (3) helping to clarify the impact of relationships, and the resources acquired through them, in the development of innovative products and services in collaborative R&D ventures.
Authors within the IMP research stream have previously identified the need for further relational models that can help explain the processes and contents of relationships between organizations (Håkansson & Snehota 1995; Håkansson & Ford 2002). Consistently, this study aims to follow that direction by fulfilling this gap on the literature of U-I networks.
From a practical perspective, this research could help practitioners in understanding the processes behind successful cooperation in R&D activities; this could contribute to offer several operational guidelines for involved actors (universities and their research centres, companies, industrial associations, policy makers, and others). From our point of view,

universities and the industry in Europe could greatly benefit from a deeper understanding of this phenomenon, in order to foster future opportunities for cooperation.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The limitations of this study encompass geographical generalizations and extensions to other knowledge areas. As mentioned in the previous sections, this study will focus on actors within networks with a common scientific background: the biological sciences. Since we aim to identify specific resources, both intellectual and relational, of this research domain, the results of our research may only be generalizable to other similar knowledge areas.
The focus of the study into to the Portuguese reality has both advantages and disadvantages: With regard to the former, assuming that innovation relies mainly on interactive and social processes, the geographical concentration of actors in a small country such as Portugal could facilitate the process of learning-by-interacting (Gertler & Levitte 2005, p.489); concurrently, studying actors within the same location can be beneficial as they are under the same influence of socio-cultural, economic and political constraints. Hence, the context influences all relationships in a similar manner. With regard to the latter, the Portuguese reality of UIL, particularly in the domain of biological sciences, may not be comparable with that of other regions of the globe, thus limiting the usability of results to other cooperation ventures between universities and companies. However, as this research stream develops it will be important to compare the development of these relationships in different cultural, economic and social settings.

As future research opportunities, we recognize the increasing importance of social components (structural and relational) in the UIL literature that may impact on the processes of resource exchange, such as the culturally dependent conducts of building up relationships, which in turn have an important effect on innovation. In our opinion, these processes have not been thoroughly studied in a University-Industry context and may help to create a research stream on University-Industry Relationships, already proposed by Plewa and Quester (2007, p.371).

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