CONNECTING WORLDS:

THE ROLE OF INNOVATION BROKERS IN THE CONTEXT OF INNOVATION NETWORKS

Sabrina Moreira Ottani[1] ; **Dr. Elena Bou Alameda**[2]

ESADE Business School - University Ramon Llull

GRACO Research Group

ABSTRACT

High level of diversity among members of innovation networks may hinder the process of innovation. To overcome difficulties, an intermediary - named innovation broker - becomes of central importance. Few studies have investigated when this intermediary is, both, an innovative agent and carrier of innovations at networks. This study deals with this imbalance by relying on an ongoing exploratory study of a Pan-European innovation network. The results, discussing the origins, functions and processes that innovation brokers engage in, show that they can improve the performance of innovation networks by helping members to overcome social and cognitive boundaries.

[1] Sabrina Moreira Ottani, Av. Pedralbes, 60-62, 08034 Barcelona - Spain.
Tel: +34 932 806 162. Fax: +34 932 048 105. E-mail: sabrina.moreira@esade.edu
She is supported by the Programme Alβan, the European Union Programme of High Level Scholarships for Latin America - Scholarship no. E07D402774BR.

[2] Dr. Elena Bou Alameda. Av. Pedralbes, 60-62, 08034 Barcelona - Spain.
Tel: +34 932 806162 Ext. 2467. Fax: +34 932 048 105. E-mail: elena.bou@esade.edu

1. INTRODUCTION

The growing importance of innovation toward competitive success and the complexity of its knowledge content have led organisations to increasingly rely on network arrangements, and in particular on innovation networks (Cowan et al., 2007; Sammarra and Biggiero, 2008). Integrating knowledge in innovation networks bring to the foreground many challenges, especially because of the diversity of network members. If this diversity is not properly managed, it may raise barriers for the creation and transfer of knowledge and thus for innovations. To transcend these barriers and ensure knowledge availability and accessibility to all members, the role of intermediaries *in* innovation networks becomes of central importance.

Hence, this paper focuses on analysing these intermediaries - here dubbed as *innovation brokers* - who aside from being innovative agents are also carriers of innovation in innovation networks. Its relevance lies in the fact that this kind of broker has not yet been systematically investigated in the literature (Williams, 2002). Moreover, very little expository work has been done on network brokers, with the current discourse being positioned at the institutional and organisational level (Oke et al., 2008; Williams, 2002; Winch and Courtney, 2007). To redress these imbalances, the aim of this paper is to shed light on how innovation brokers can help organisations in an innovation network to overcome internal barriers, to reach a common understanding and to promote knowledge creation and transfer.

The paper begins with a discussion of some particularities of innovation networks which make them propitious contexts for the emergence of innovation brokers. This is followed by an analysis of the role of innovation brokers in these networks in an attempt to better understand their origins, their functions and the processes triggered by them to bridge unconnected worlds. What follow is an outline of the research method employed in the ongoing study of a pan-European innovation network and a discussion of the findings about the role of innovation brokers. They show that as innovation brokers are informally assigned, legitimation becomes essential for enabling their existence and endurance. Besides, these brokers help innovation networks to enhance their performance by mediating relational capabilities and overcoming knowledge boundaries. When mediating relationships, innovation brokers tend to create shared awareness and understanding to succeed in their tasks. And when acting as knowledge orchestrators, they do so to fulfil their activities as innovative agents. In both cases innovation brokers rely on the use of several bridging mechanism, such as rhetorical devices and boundary objects.

2. THEORETICAL BACKGROUND

2.1. Innovation Networks and their Idiosyncrasies

In order to develop superior innovation outcomes organisations are increasingly joining in network arrangements - and particularly innovation networks - as the knowledge necessary to innovate may lie outside an organisation's core competences (Dhanaraj and Parkhe, 2006; Freeman, 1991; Powell et al., 1996). Innovation networks are specific settings where interrelated but heterogeneous innovative agents are brought together to promote a creative abrasion[3] that may allow organisations to integrate complementary competencies, to learn from a wide stock of knowledge and to enhance their innovation potential (Sammarra and Biggiero, 2008). On the other side, if the diversity that members bring into the network is not properly managed, it can foster an "intellectual conflict" among participants, thus lowering the level of proximity among them and encouraging the emergence of inefficient and isolated epistemic communities.

2.1.1. Innovation Networks: Members Diversity and their Lack of Proximity

Although a certain level of diversity among networks members is desired for innovation networks to succeed, too much diversity may be detrimental as it will impact on a basic requirement for network effectiveness: proximity (Boschma, 2005; Sammarra and Biggiero, 2008). Among the several forms of proximity that can be found in the literature (i.e.: geographical, cultural, temporal, etc.), this paper, framed by its context of analysis, focuses on three dimensions of proximity relevant for knowledge to flow from one actor to another in innovation-related activities: institutional, organisational and cognitive proximity.

Institutional proximity is associated with the institutional framework that guides and control the behaviour of actors in a macro-level (Boschma, 2005; Hyypiä and Kautonen, 2005). *Organisational proximity* relates to the sharing of common goals and practices among agents within an organisational arrangement (Boschma, 2005; Lorentzen, 2007). *Cognitive proximity* captures the communalities between actors in terms of knowledge bases, languages and ways of thinking (Graf, 2006; Hyypiä and Kautonen, 2005). To a certain extent, knowledge bases have to be different for generating new synthesis of knowledge and thus innovations. However, knowledge from external sources can only be absorbed if the cognitive gap is not too wide and sufficient proximity exists (Ottani and Bou, 2008).

---

[3] The concept of creative abrasion stems from the thought of fusing various and often divergent viewpoints in order to promote breakthrough innovation that could not be reached by organisations acting on their own. To do so, members should be receptive to cognitive diversity by respecting each other's viewpoints even without always agreeing with it (Leonard-Barton and Sensiper, 2005; Powell and Grodal, 2005).

Within these three mentioned forms, institutional and organisational proximity are here perceived as two dimensions closely related to network structure. That is to say, their respective distances could be lessened by a better management of the network or by fostering a new institutional frame with common norms, rules and processes. On the other side, such solutions would not stimulate cognitive proximity among network participants, thus requiring other tools to overcome distinct boundaries based on differences in language (syntactic boundaries), understanding (semantic boundaries) and practice (pragmatic boundaries) (Carlile, 2002, 2004).

Crossing such boundaries means to combine knowledge that is decentralised throughout the network and spatially bounded, to harmonise dissimilar cognitive frames and to build a shared understanding. However, this bridging process is far from being automatic or simple, requiring some coordination so that the absorptive capacity[4] of each organisation, their motivation and their commitment for making such exchange beneficial can all be increased. To do so, network members may rely on **intermediaries** to promote the internal balance that the innovation network could not naturally reach, to foster mechanisms which would span organisational boundaries and to entail the opportunity for mutual understanding and for transferring knowledge more effectively (Orlikowski, 2002).

2.2. Bridging Different Knowledge Domains: The Role of Innovation Broker

Although there is an increasing interest on the role of intermediaries in the innovation process, the literature is yet theoretically fragmented and surprisingly disparate (Klerkx and Leeuwis, 2009). The majority of studies have concentrated on the role played by third-party organisations who are focused neither on the generation nor on the implementation of the innovation, but on giving support to organisations that are looking for innovations (Smits and Kuhlmann, 2004; Van Lente et al., 2003; Winch and Courtney, 2007). Less attention has been given to those **intermediaries who aside from being innovative agents are also carriers of innovation** (Howells, 2006; Klerkx and Leeuwis, 2009; Winch and Courtney, 2007). Moreover, the discourse adopted within these studies is more positioned at the institutional and organisational level, with little attention being accorded to the pivotal role of individual actors in the management of interorganisational relationships (Oke et al., 2008; Williams, 2002; Winch and Courtney, 2007).

As so, this paper attempts to redress these imbalances by focusing on the role of intermediaries - here dubbed as *innovation brokers* - who are members of an innovation network and also fulfil a side activity of intermediation. Hence, the aim is to shed light on the origins of innovation brokers *in* innovation networks, the processes triggered by them alongside the instruments used to help organisations to overcome internal barriers,

---

[4] Absorptive capacity refers to the ability of an organisation to value, assimilate and apply new knowledge from a partner (Cohen and Levinthal, 1990).

to reach a common understanding and to promote knowledge creation and transfer for innovation.

2.2.1. Origins of the Innovation Broker

Studies that have investigated the role of innovation brokers *in* innovation networks have mainly taken their existence for granted (Fleeming et al., 2007; Ryall and Sorenson, 2007). Such perception fails to recognise the importance of better understanding the motives behind the emergence of these brokers, what will be decisively to determine their roles and subsequent functions in a network.

The emergence of innovation brokers is often contingent on specific needs of an innovation network, such as dealing with high levels of distance among network members, lack of trust hampering relational capabilities, unforeseen situations, misalignment of objectives, difficulties in understanding novel knowledge, unfamiliarity with the use of tools or methods, and so forth. Such suboptimal connectivity among network members may lead innovation brokers to be formally or informally assigned. The problem with formal designation is that innovation brokers might not be truly engaged in boundary spanning activities. In both situations, innovation brokers are chosen based on their inclination to perform bridging activities, their reputation and influence within the network, their relationships with other participants, their skills and knowledge possessed. Moreover, the broker needs to be internally legitimised, what will allow him/her to act and influence the development of a practice.

2.2.2. Types of Innovation Brokers and their Functions

According to the requirements of an innovation network, innovation brokers can assume different stripes. An array of roles attributed to innovation broker can be found in the literature, such as *entrepreneur* (Hekkert et al, 2007), *filter/legitimator* (Johnson, 2008), *guard* (Pawlowski and Robey, 2004) and *resource mobilizer* (Winch and Courtney, 2007). However, these studies indistinctly interweave some managerial roles required for the well-functioning of these networks with the role of the innovation broker. Activities like attracting resources and external awareness, managing membership and infrastructure should be kept detached from the role of the innovation broker, who shall concentrates on bridging unconnected groups within the network.

Based on this consideration, one could consider that the innovation broker may play three roles *in* the innovation network that will influence the functions that he/she is expected to fulfil: knowledge orchestrator, mediator/arbitrator, sensemaker. *Knowledge orchestrator* fosters knowledge mobility by orchestrating knowledge exchange and transfer throughout the innovation network (Dhanaraj and Parkhe, 2006).

Mediator/arbitrator intervenes in cases of dispute in order to promote network stability and development. *Sensemaker* guides on initiating the collaborative process of creating shared awareness and understanding out of different individuals' perspective and varied interests (Weick, 1995).

Table 1: Types of Innovation Brokers and their Functions

TYPOLOGY	FUNCTIONS	ADAPTED FROM
Knowledge Orchestrator	• To bridge unconnected groups • To transfer, translate and transform knowledge • To create boundary objects	Carlile (2002, 2004) Hargadon (1998) Hekkert et al. (2007) Klerkx and Lewis (2009) Swan et al. (2008)
Mediator/Arbitrator	• To solve conflicts and attritions • To ensure that all network participants are involved • To initiate alignment and consensus • To manage network stability	Hekkert et al. (2007) Howells (2006) Swan et al. (2007)
Sensemaker	• To create shared awareness and understanding • To provide a platform for learning (learn by doing, learn by using, learn by interacting)	Hekkert et al. (2007) Pawlowski and Robey (2004) Ringberg and Reihlen (2008) Weick (1995) Wenger (1998)

These roles and functions are subject to changes as the innovation network goes through different phases of development. In order to be able to perform such roles and correspondent functions, innovation brokers engage in some processes to transcend existing barriers in these networks. However, as brokering is a task of high complexity, innovation brokers may resort to the use of some instruments to facilitate the execution of such actions.

2.2.3. Processes Triggered by Innovation Brokers and Instruments Used to Help Processes

Broadly, innovation brokers facilitate two groups of processes: one associated to the development and management of relational capabilities of network members, and other related to the management of knowledge boundaries. In the first group of processes, innovation brokers engage, first, in a process of exploring, discovering and understanding the mosaic of members that compose these networks, so they can identify potential areas of communality and interdependency and problematic areas that will need further bridging (Williams, 2002). Besides, innovation brokers should engage in processes of managing relationships by influencing and negotiating. To do so, the broker must resort to persuasion and diplomacy, leading in some occasions while facilitating in others. Networking is important in this process to allow them to be present where difficulties are shared, aims are agreed, problems are sorted out and

commitments are made, so brokers are able to manage motivations and interactions (Williams, 2002).

On the other side, in the second group, innovation brokers are oriented towards managing knowledge boundaries by promoting processes of transfer, translation and transformation of knowledge (Carlile, 2004). To ensure that knowledge is available to all actors throughout the network and to help reconcile discrepancies in meaning, innovation brokers rely on the use of mechanisms that provide the capacity to negotiate different functional interests and to transform knowledge sources in a way that it can be understood by those who have to use it (Carlile, 2002; Swan et al. 2007).

Instruments used by Innovation Brokers

One of the mechanisms used by innovation brokers to facilitate the ongoing convergence of knowledge (Macpherson, 2008), to promote discourse and dialogue, to create common ground and to provide boundary engagements is the use of mediating objects. An object becomes a boundary object when it is able to represent the differences and dependencies between actors involved in the innovation network and to be used as a container and carrier of knowledge. As so, it should possess characteristics like modularity (each actor can attend to one specific portion of the boundary object), abstraction (all perspectives are served at once by the deletion of features that are specific to each individual knowledge), accommodation (the boundary object lend itself to various activities) and standardisation (the information contained in a boundary object is in a pre-specified form so that each actor knows how to deal with it locally) (Wenger, 1998). No matter what form they assume - artefacts, visual aids or vocabulary-based - boundary objects must be built on interpretive flexibility to allow for multiple interpretations and uses (Pawlowski and Robey, 2004), to provide means for network members to learn about their differences and dependencies and jointly transform their knowledge, to promote interconnections and overcome knowledge boundaries.

Apart from relying on the use of boundary objects to arrive at a common ground, innovation brokers may resort to other mechanisms to bridge knowledge across boundaries. One of them is the use of rhetorical devices that allow innovation brokers to rely on their reasoning (logos), feelings (pathos) or credibility (ethos) to achieve a common understanding. Another mechanism is the use of narratives to provide a means of knowledge sharing and of the generation of new inferences.

Independent of the instrument used to diminish the cognitive distance among members of innovation networks, combining these objects with boundary-spanning activities will enable knowledge integration and transfer across boundaries to gradually unfold. Nonetheless, in the absence of any of these mechanisms the possibility to arrive at common understanding is limited and the opportunity for reaching a successful innovation outcome is reduced.

3. EMPIRICAL STUDY AND RESEARCH DESIGN

To reach a better understanding of the role/functions played by the innovation broker, an exploratory research is being conducted. This ongoing exploratory research is based on an ethnographic study developed in an innovation network involving forty six members from twelve European countries that were brought together in a project organised by the European Commission to develop a new model to structure and manage collaborations. Network members are from an array of institutional spheres, comprising researchers, industry participants and academics involved with sustainable energy and climate change. The project is structured in three different but interdependent phases, as follows.

Since the role of innovation brokers *in* innovation networks has been little analysed, a qualitative research design was used as there was a need for in-depth understanding, contextualisation and exposing the viewpoints of people under study. Moreover, analysing innovation brokers through the lenses of a qualitative inductive research would help to introduce new theoretical ideas into the current discourse as the tool commonly employed to analyse this phenomenon (social network analysis) concentrates on the structure of ties but does not take into consideration the role of brokers as needed.

This particular network was chosen as an object of study due to the possibility of analysing the network since its inception as well as having access to the network as a whole, what would permit to focus on the impacts of innovation brokers at the network level instead of concentrating on individual actors. Besides, the case offers a good example where the interventions of innovation brokers are relevant to help to lessen or to overcome some difficulties and obstacles that arise due to the idiosyncrasies of innovation networks.

This study comprises two phases. The first phase is dedicated to conducting ethnographic observation as a complete participant[5] over a twelve-month period and a focus group exercise. Secondary data is also used, resorting to internal e-mails, documents, reports and other project outcomes. The use of multiple data sources allowed for data triangulation so as to avoid single-method bias.

---

[5] In participant observation, when acting as a *complete participant* the researcher actively engages with other members of the setting. It offers an interesting window of understanding the social world from the vantage point of those residing in it. However, the research's identity is not known to the participants in the setting as he/she wants to be treated as an authentic member (Hesse-Biber and Leavy, 2006).

Bellow, the collection of ethnographic data is reported in detail.

Table 2: Details of the Ethnographic Data

DETAILS OF THE ETHNOGRAPHIC DATA	
Field Observation (Number of Months)	14
Number of Meetings Attended	32
Number of Hours of Meetings Attended	138
Hours of Recorded Audio Files	25

Data analysis involved a careful reading and viewing of collected documents, meeting transcripts and field notes based on some codes developed in terms of conditions, actions and consequences of the role of innovation brokers. Besides, the analysis undertaken was also triangulated within the investigators participating in the research to avoid single-observer bias and to capture a more complete and contextualised portrait of the phenomenon under study.

The second phase of the study, to be later developed, is dedicated to conducting in-depth interviews to gather information on how network participants perceived their experiences with innovation brokers.

Some limitations of this study are related to the absence of comparison with innovation networks settled in other contexts and the necessity of conducting in-depth interviews. Also some of the results obtained may be impacted over time as this is still an ongoing research (since the project is not concluded yet).

Although data collection is still ongoing, the here reported data was gathered from December 2007 to February 2009. Based on it, preliminary findings are offered, illustrated with some excerpts taken from the ethnographer research diary.

4. FINDINGS

The network under analysis is formed by a group of members who joined together with a double objective: to develop in the short-term a generic model of collaboration with an underlying long-term objective of preparing themselves for being an accredited innovation network. To achieve such aims, participants belong to the fields of sustainable energy and climate change, with exception of two business schools. Even tough, the level of complexity within the innovation network is high, especially

due to the distance that exists among network members as they are from different institutional backgrounds - such as technical universities, research centres and industry - and as they have different thematic backgrounds, ranging from renewable to nuclear energy.

The diversity of members led to some difficulties in understanding due to their different lexicon, knowledge base and mental models.

Vignette 1:   *… Some members discussed the difficulties they had to understand some of the words used in the questionnaire (i.e. formation of spin-offs, closed collaboration, sub-supplier), affecting the overall results of the task….* (Source: phase 1 workshop, April 2008)

Vignette 2:   *… There is an implicit battle between the 'social scientists' and the 'practitioners', each using their own knowledge base as a way of protecting their viewpoints (i.e.: "Well, if we are going to decide what should be included in the project we must not forget energy grids and power plants")…* (Source: phase 1 workshop, April 2008)

As the network evolved, it was possible to notice that this diversity also reflected on a lack of organisational proximity. Although there was an apparent common objective that bound them together, indeed, during the course of action, participants were resorting to their individual organisational objectives, thus promoting an environment favourable for stimulating competition.

Vignette 3:   *… Participants from industry were asking members to "rethink their objectives because some of the things proposed (i.e. to work jointly with the climate change sector) were already being done. If something new was not going to be proposed, then they would rethink their participation in the project…"* (Source: project six-months meeting, June 2008).

Vignette 4:   *…Some participants commented that "they could not understand why the field of climate change should be considered in the project. By focusing on sustainable energy, there was no need to also concentrate on climate change…"* (Source: phase 1 workshop, April 2008).

Members started then to diverge in terms of how activities should be undertaken and who should be assigned to complete them, leading into disagreements and confrontations. The diplomatic position assumed by project and task leaders did not help on the development of trust among members.

Vignette 5:   *… Tension rose when someone mentioned that "if the model to be developed in phase 2 was going to be applied in the institutions present in the meeting, then it was not possible to understand why the institution which this person belongs to was not participating in this phase. The task leader avoided confrontation and mentioned that they were not discussing phase 2 and that later on*

they could discuss that subject...” (Source: phase 1 workshop, February 2008)

Vignette 6: *... One participant was making a presentation comparing the European and the American energy innovation systems. After the presentation had finished, another person confronted some of the facts discussed, which led the presenter to immediately react stating that “he did not care as it was his personal view...”* (Source: phase 1 final meeting, June 2008).

Within this context of misalignments and distance, the network faced an unforeseen situation that added more conflict to the project. As participants started to work, they realised that they did not possessed the required knowledge to propose a new generic model for structuring and managing collaborations. This brought the members from business schools (members A and B) to the fore in the network. At a first moment, this was a problematic issue as these members would have a more important role than previously expected and also because of the institutional distance that existed among network participants.

Vignette 7: *... After the suggestion presented by member A, another participant immediately reacted, mentioning that “people from academia are self-referring, they always want to be the ones who decide what is good, how to test it and to determine if something is successful... very typical from academia...”* (Source: phase 1 final meeting, June 2008).

Vignette 8: *… One member from the industry commented that “the industry needs universities just as a source of knowledge. The industry is faster in creating innovations and making money from it...”* (Source: project six-months meeting, June 2008).

However, network members begun to realise that they could only achieve the objectives of the project if they resorted to members A and B. A network member from a technical university (member C) had a fundamental role in this process, by listening and helping to bridge both worlds.

Vignette 9: *... After the presentation of the collaboration model by member A, member C mentioned that although phase 2 was invisible for them for a long time, when the final chapter was reached they were very happy because they could recognize their work...”* (Source: phase 3 meeting, November 2008).

Vignette 10: *… Participants were strongly disagreeing with the activities being proposed for phase 3. Member A intervened reinforcing the idea that “all should have in mind the applicability and agreement of this phase of the project with previous phases.” Member C agreed with these considerations and said that “the criteria for selecting activities in phase 3 should be then re-discussed. After that, all members should trust task leaders and let them do their work...”* (Source: phase 2 first meeting, June 2008).

As network members continued to rely on members A, B and C for steering the network into the right direction, this gave them internal legitimation to act as **innovation brokers** *in* the network.

Vignette 11: *…Because of member A's considerations in the meeting, one participant at the end of the meeting came to congratulate and to comment that "member A was acting as the 'practitioner' leading them to the right direction while all the other members in the meeting were acting as 'visioners'…"*(Source: phase 1 workshop, February 2008).

Vignette 12: *… Participants were disagreeing with the proposal of the task leader to hand in the first draft of the report from phase 1in two weeks. Besides, it was not clear who and how it should be done. Members A and B clarified some issues related to it, such as negotiating a new deadline, and called the responsibility of doing it on time if all network members could help as well…* (Source: phase 1 workshop, April 2008).

However, these innovation brokers were not clearly aware of their role as brokers in the network. For instance, when they engaged in situations of orchestrating knowledge within the network, they did it so they could establish a shared understanding that would allow them to carry on with their work.

Vignette 13: *At the beginning, as members did not have a clear understanding of the questionnaire, they were skeptical if by using it they were going to be able to grasp the details of the collaborations being studied and to achieve the objectives of phase 1. However, after member B explained it in detail, participants commented that now they could better understand the questionnaire and its motive, what was being asked and also the results achieved. The group agreed that there was an evolution in terms of knowledge and understanding of the project in comparison with previous meetings. Some members wanted to take the lessons learnt from 1st round of the questionnaire and redo it…* (Source: phase 1 meeting, February 2008).

To help them on such tasks, innovation brokers also resorted to the use of some instruments, like boundary objects (i.e. models, definitions, metaphors and jokes) and rhetorical devices (i.e. reasoning skills and internal reputation).

Vignette 14: *Participants were having difficulties to understand the results obtained with the questionnaire. To enable a better understanding, member B created a metaphor ("no size fits all"). Later on, network members used this metaphor when they wanted to refer to phase 1…* (Source: phase 1 final meeting, June 2008).

Vignette 15: *... Member A's presentation started in a different way. The first PowerPoint slide was a photograph of Spanish football team winning the European Championship and explaining their motto "let's beat them". Member A used it as a metaphor to engage*

participants in the activities of phase 2, to trust that they can do a good job together and reach a successful outcome... (Source: phase 2 initial meeting, June 2008).

Vignette 16:   *… To explain the methodology of phase 2 and its activities, Member A represented it with a model. However, as other participants were not social scientists, some of the jargons used were hard to grasp (i.e. focus group, open-ended questionnaire, case study). Member A had then to translate these words (with definitions, concepts, metaphors and drawings) so everyone could understand forthcoming activities and actively participate...* (Source: phase 2 initial meeting, June 2008).

5. ANALYSIS

In the innovation network under study, innovation brokers were informally called to perform bridging activities in situation when a disconnection between network members was observed. Disconnections could be due to difficulties in engaging members into network activities, to unfamiliarity with the lexicon being used or even due to a lack of relational capabilities. To avoid that a disconnection could prevent the network from achieving its objectives, innovation brokers act helped by the use of some bridging objects or mechanisms. As the innovation brokers were not aware of their brokering roles, they acted as a consequence of observed disconnections and not as an anticipation of forthcoming issues. Depending on the source of the disconnection, innovation brokers performed a different role in the network. Disconnections, actions taken by innovation brokers and the objects used by them were obtained from the fieldwork. The source of disconnection and the role played by the innovation brokers were reached after careful consideration of the findings from both empirical and theoretical work. These ideas are represented in the proposed framework bellow.

Figure 1: Proposed Framework for Analysis
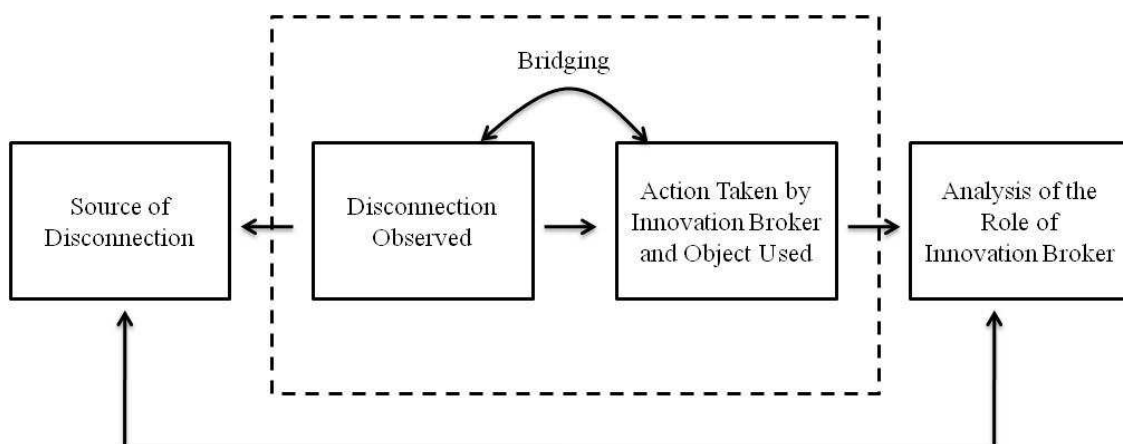
In order to complement the analysis, the table that follows depicts some situations of disconnection faced by the network, which are representative to shed some light on the understanding of the role of innovation brokers.

Table 3: The Role of Innovation Brokers: Disconnections and Actions Taken

Vignette	Source of Disconnection	Disconnection	Action Taken by Innovation Broker and Object Used	Analysis of the Role of Innovation Broker
Vignette 13: ...At the beginning... members did not have a clear understanding of the questionnaire.... However, after member B explained it in details, participants commented that now they could better understand the questionnaire.... The group agreed that there was an evolution in terms of knowledge and understanding... (Source: phase 1 meeting, February 2008). Vignette 15: ... Member A's presentation started in a different way. The first PowerPoint slide was a photograph of Spanish football team winning the European Championship and explaining their motto "'let's beat them". Member A used it as a metaphor to engage participants in the activities of phase 2, to trust that they can do a good job together and reach a successful outcome... (Source: phase 2 initial meeting, June 2008)	Unfamiliarity with the use of tools/methods (i.e. questionnaire, focus group, in-depth interviews)	• Difficult to engage network members • No expected Contribution	• To manage motivations and interactions • To transfer, translate and transform knowledge • To create boundary objects • Objects Used: ✓ Rhetoric Device: Pathos (i.e. "let's beat them", "we can do a good job together") ✓ Metaphor (i.e.: "we are like the Spanish football team") ✓ Jokes (i.e.: "two odd business schools") ✓ Photograph	Knowledge Orchestrator
Vignette 12: ... Participants were disagreeing with the proposal of the task leader to hand in the first draft of the report from phase 1 in two weeks. Besides, it was not clear who and how it should be done. Members A and B clarified some issues related to it, such as negotiating a new deadline, and called the responsibility of doing it on time if all network members could help as well... (Source: phase 1 workshop, April 2008).	Deadline and Deliveries	✓ Difficulties in determining who should be responsible for reports	• To ensure that all network participants are involved • To solve conflicts and attrition • To create shared awareness and understanding • To Influence and negotiate • Object Used: ✓ Rhetoric Device: Logos	Mediator Sensemaker

Vignette	Source of Disconnection	Disconnection	Action Taken by Innovation Broker and Object Used	Analysis of the Role of Innovation Broker
Vignette 1: …*Some members discussed the difficulties they had to understand some of the words used in the questionnaire* … (Source: phase 1 workshop, April 2008). Vignette 14: *Participants were having difficulties to understand the results obtained with the questionnaire. To enable a better understanding, member B created a metaphor…* (Source: phase 1 final meeting, June 2008). Vignette 16: *To explain the methodology of phase 2 and its activities, Member A represented it with a model. However, as other participants were not social scientists, some of the jargons used were hard to grasp (i.e: focus group, …). Member A had then to translate these words (with drawings…) so everyone could understand…* (Source: phase 2 initial meeting, June 2008).	Cognitive Distance	• Unfamiliarity with lexicon used (i.e.: *closed collaboration, climate, vignettes*) • Difficulties in understanding (i.e.: *"the model is something trivial that can be done in two weeks"*) • Different mental models • Different knowledge base	• To transfer, transform and translate knowledge • To manage knowledge boundaries Objects Used: ✓ Metaphor (i.e.: "no size fits all") ✓ Definitions and concepts (i.e.: creative abrasion) ✓ Use of schemas near to members (i.e.: formula: - diversity → f (proximity) ✓ Drawings (i.e.: group of people conducting interviews)	Knowledge Orchestrator
Vignette 3: … *Participants from industry were asking members to "rethink their objectives because some of the things proposed… were already being done. If something new was not going to be proposed, then they would rethink their participation in the project…"* (Source: project six-months meeting, June 2008). Vignette 4: " *…they could not understand why the field of climate change should be considered in the project. By focusing on sustainable energy, there was no need to also concentrate on climate change…"* (Source: phase 1 workshop, April 2008).	Organisational	• Different objectives and expectations	• To solve conflicts and attritions • To initiate alignment and consensus • To Influence and Negotiate Object Used: ✓ Rhetorical Device: Logos (*Members A and B explained that the objectives of the project was not to go a step forward in the fields of energy and climate change, but to propose a generic model of collaboration…*) (Source: project six-months meeting, June 2008).	Mediator Sensemaker

Vignette	Source of Disconnection	Disconnection	Action Taken by Innovation Broker and Object Used	Analysis of the Role of Innovation Broker
Vignette 7: ... After the suggestion presented by member A, another participant immediately reacted, mentioning that "people from academia are self-referring, they always want to be the ones who decide what is good, how to test it and to determine if something is successful... very typical from academia...." (Source: phase 1 final meeting, June 2008). Vignette 8: ...One member from the industry commented that "the industry needs universities just as a source of knowledge. The industry is faster in creating innovations and making money from it..." (Source: six-months meeting, June 2008).	Distance / Institutional	• Different institutional framework	• To initiate alignment and consensus • To Influence and negotiate • Object Used: ✓ Rhetorical Device: Logos (Member B mentioned that "although some industries work together with universities for financial reasons, there are cases where the outcomes of the collaboration are what matters..." (Source: six-months meeting, June 2008).	Failed to Bridge
Vignette 5: "... if the model to be developed in phase 2 was going to be applied in the institutions present in the meeting, then it was not possible to understand why the institution which this person belongs to was not participating in this phase ..." (Source: phase 1 workshop, February 2008). Vignette 6: ... One participant was making a presentation ... After the presentation had finished, another person confronted some of the facts discussed, which led the presenter to immediately react stating that "he did not care as it was his personal view..." (Source: phase 1 final meeting, June 2008).	Lack of Trust	• Misalignments between members • Lack of relational capabilities • Competition among network members	• To initiate alignment and consensus • To create shared awareness and understanding • To Influence and Negotiate • Objects Used: ✓ Rhetorical Device: Logos (...Member B replied that "it was not possible to present something just based on a personal view, without being solid sustained...") (Source: phase 1 final meeting, June 2008). ✓ Rhetorical Device: Pathos (...Member A commented that "the objectives of phase 2 could only be achieved with the support of all members...") (Source: phase 2 initial meeting, June 2008)	Mediator / Sensemaker

Through the analysis of this diverse range of situations, some interesting issues stand out. It is possible to perceive that innovation brokers, when acting as a mediator to overcome situations of conflict, have mostly created a shared awareness and understanding to facilitate the achievement of alignment and consensus. In such cases, they relied on the use of rhetorical devices to help them on these tasks. However, they failed to bridge members when the source of disconnection was institutional distance. Although they intervened to stress the need of promoting a collaboration based on complementarities, members kept reinforcing the traditional roles of university (to provide knowledge), industry (to commercialise products) and government (to fund projects and act as an authority force).

Hypothesis 1: When mediating conflicts, innovation brokers resort to rhetorical devices to fulfil their tasks.

Hypothesis 2: When mediating conflicts, innovation brokers create a shared awareness and understanding to succeed in their tasks.

Regarding the situations that innovation brokers had to act as knowledge orchestrators so they could successfully complete their role as innovative agents, these brokers relied on the power of boundary objects to overcome cognitive boundaries. Due to the characteristic of the knowledge being created by them, boundary objects such as photographs, metaphors and drawings proved to be very successful. In one particular occasion, the broker lent himself/herself to be a boundary object. It was when network members could not understand, at the beginning, the questionnaire done in phase 1. However, after some meetings where member B explained it in detail, participants commented that they could not only understand the questionnaire itself but also the objectives of the project.

Hypothesis 3: When acting as knowledge orchestrators, innovation brokers are able to fulfil their activities as innovative agents.

Hypothesis 4: When acting as knowledge orchestrators, the creation of boundary objects is fundamental for overcoming cognitive boundaries.

6. CONCLUSION

The research findings indicate that although the diversity brought into the innovation network by divergent network members was beneficial to the objectives of the project under analysis, it was detrimental to the creation and transfer of knowledge. Even when a common syntax was present, interpretations were often different, making communication and collaboration difficult and thus hampering the possibilities for knowledge integration.

As the network evolved in time, participants realised that did not possess the required knowledge to fulfil network tasks and thus achieve the desired objectives. To overcome such difficulties, participants had no choice but to resort to members from business schools. At first, this was another source of conflict in the network as these members were getting more attention than previously thought. However, as they gained internal legitimacy, not only due to their knowledge but also because of their skills, these participants were informally assigned to act as innovation brokers, mediating different functional interests and making trade-offs among network members in terms of participation in the creation of knowledge. To be able to perform their activities as network members, they found themselves in the position of knowledge orchestrators, trying to overcome boundaries based on differences in language, understanding and practice. To do so, these mediators resorted to different mechanisms that could facilitate the development of a common understanding. They relied on rhetorical devices when attempting to mediate conflicts and manage relational capabilities, and they created boundary objects when trying to facilitate the integration of knowledge.

The contribution of this paper is to offer insights on how important innovation brokers are to innovation networks, on how they come to occupy such positions, what are the processes that they engage in and how they can improve the performance of innovation networks themselves by helping members to overcome social and cognitive boundaries. In addressing these issues related to innovation brokers, this paper seeks to enable the proposition of additional elements for the existing literature on innovation networks and innovation brokers as it answers the call for studies of actual practices of successful innovation brokers (Winch and Courtney, 2007).

7.   FURTHER RESEARCHES

In addition, some issues call for further investigation. For instance, there is a need to better understand how innovation brokers transfer and integrate knowledge throughout innovation networks, thus dealing with different cognitive models and mental representations. Besides, there is also a room for analysis on how innovation brokers *in* innovation networks find a balance between their own interests and the network overall good to avoid damaging the network development. And finally, to investigate if the role of these brokers would have been different once they were aware of their importance to the network.

8. BIBLIOGRAPHY

Boschma, R. (2005), 'Proximity and Innovation: A Critical Assessment'. *Regional Studies*, vol. 39, no. 1, pp. 61 - 74.

Carlile, P. (2004), 'Transferring, Translating and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries'. *Organization Science*, vol. 15, no. 5, pp. 555 - 568.

Carlile, P. (2002), 'A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development'. *Organization Science*, vol. 13, no. 4, pp. 442 - 455.

Cohen, W. and Levinthal, D. (1989), 'Innovation and Learning: The Two Faces of R&D', *The Economic Journal,* vol. 99 (September 1989), pp. 569 – 596.

Cowan, R; Jonard, N. and Zimmermann, J. (2007), 'Bilateral Collaboration and the Emergence of Innovation Networks', *Management Science,* vol. 53, no. 7, pp. 1051 – 1067.

Dhanaraj, C. and Parkhe, A. (2006), 'Orchestrating Innovation Networks', *Academy of Management Review,* vol. 31, no. 3, pp. 659 – 669.

Fleeming, L.; Mingo, S and Chen, D. (2007), 'Collaborative Brokerage, Generative Creativity and Creative Success', *Administrative Science Quarterly,* vol. 52, pp: 443 - 475.

Freeman, C. (1991), 'Networks of Innovators: A Synthesis of Research Issues' *Research Policy*, vol. 20, pp. 499 – 514.

Graf, H. (2006), *Networks in the Innovation Process: Local and Regional Interaction.* Edward Elgar Publishing, Cheltenham, pp. 1 – 27.

Hargadon, A. (1998), 'Firms as Knowledge Brokers: Lessons in Pursuing Continuous Innovation', *California Management Review*, vol. 40, no. 3, 209 - 227.

Hekkert, M.; Suurs, R.; Negro, S.; Kuhlmann, S. and Smits, R. (2007), 'Functions of Innovation Systems: A New Approach for Analysing Technological Change'. *Technological Forecasting and Social Change*, vol. 74, pp. 413 - 432.

Hesse-Biber, S. and Leavy, P. (2006), *The Practice of Qualitative Research*, SAGE Publications, New York.

Howells, J. (2006), 'Intermediation and the Role of Intermediaries in Innovation'. *Research Policy*, vol. 35, pp. 715 - 728.

Hyypiä, M. and Kautonen, M. (2005), 'Dimensions of Proximity in Relationships Between Knowledge Intensive Business Service and their Clients: Theoretical Considerations with Empirical Observation from a Study in Helsinki Region, Finland'. *Regional Studies Association International Conference on Regional Growth Agendas,* Aalborg, Denmark.

Johnson, W. (2008), 'Roles, Resources and Benefits of Intermediate Organizations Supporting Triple Helix Collaborative R&D: The Case of Precarn', *Technovation*, vol. 28, pp. 495 - 505.

Klerkx, L. and Leeuwis, C. (2009), 'Establishment and Embedding of Innovation Brokers at Different Innovation System Levels: Insights from the Dutch Agricultural Sector', *Technological Forecasting and Social Change,* in press.

Leonard-Barton, D. and Sensiper, S. (2005), 'The Role of Tacit Knowledge in Group Innovation', *California Management Review*, vol. 40, no. 3, pp. 112 - 132.

Lorentzen, A. (2007), 'The Spatial Dimension of Innovation: Embedding Proximity in Socio-Economic Space', *Paper for the 10th International Conference of the European Network on Industrial Policy*, University of Florence, Florence.

Macpherson, A. (2008), 'Making Sense of Mediated Learning in Small Firms', *OLKC Conference*, Copenhagen.

Oke, A.; Idiagbon-Oke, M. and Walumbwa, F. (2008), 'The Relationship between Brokers' Influence, Strength of Ties and NPD Project Outcomes in Innovation-driven Horizontal Networks', *Journal of Operations Management*, vol. 26, pp. 571 - 589.

Orlikowski, W. (2002), 'Knowing in Practice: Enacting a Collective Capability in Distributed Organizing', *Organization Science*, vol. 13, no. 3, pp.249 - 273.

Ottani, S. and Bou, A. (2008), 'Diversity of Members in the Context of Innovation Networks', in Bou, A. et al (eds.), *SUCCESS WP2 Model Design: Creating a New Collaboration Model*, SUCCESS Pilot Study, WP2, Barcelona.

Pawlowski, S. and Robey, D. (2004), 'Bridging User Organizations: Knowledge Brokering and the Work of Information Technology Professional', *MIS Quarterly*, vol. 28, no. 4, pp. 645 - 672.

Powell, W. and Grodal, S. (2004), 'Networks of Innovators' in Fagerber, J; Mowery, D. and Nelson, R. (eds.), *The Oxford Handbook of Innovation*, Oxford University Press, New York, pp. 56 – 85.

Powell, W.; Koput, K. and Smith-Doerr, L. (1996), 'Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology', *Administrative Science Quarterly*, vol. 41, no.1, pp. 116 - 145.

Ringberg, T. and Reihlen, M. (2008), 'Towards a Socio-Cognitive Approach to Knowledge Transfer', *Journal of Management Studies*, vol. 45, no. 5, pp. 912 - 935.

Ryall, M. and Sorenson, O. (2007), 'Brokers and Competitive Advantage', *Management Science*, vol. 53, no.4, pp. 566 - 583.

Sammarra, A. and Biggiero, L. (2008), 'Heterogeneity and Specificity of Inter-firm Knowledge Flows in Innovation Networks', *Journal of Management Studies*, vol. 45, no. 4, pp. 800 - 829.

Smits, R. and Kuhlmann, S. (2004), 'The Rise of Systemic Instruments in Innovation Policy', *International Journal of Foresight and Innovation Policy*, vol.1, no.1/2, pp.4 - 32.

Swan, J.; Bresnen, M.; Newell, S. and Robertson, M. (2008), 'The Object of Knowledge: The Role of Objects in Biomedical Innovation', *Human Relations*, vol. 60, pp. 1809 - 1837.

Swan, J.; Goussevskaia, A.; Newell, S.; Robertson, M.; Bresnen, M. and Obembe, A. (2007), 'Modes of Organizing Biomedical Innovation in the UK and US and the Role of Integrative and Relational Capabilities', *Research Policy*, vol. 36, pp. 529 - 547.

Van Lente, H.; Hekkert, M.; Smits, R. and Van Waveren, B. (2003), 'Roles of Systemic Intermediaries in Transition Processes, *International Journal of Innovation Management*, vol.7, no. 3, pp. 1 - 33.

Weick, K. (1995), *Sensemaking in Organizations*, Sage, London.

Wenger, E. (2008), *Communities of Practice: Learning, Meaning and Identity*, Cambridge University Press, Cambridge.

Williams, P. (2002), 'The Competent Boundary Spanner', *Public Administration*, vol. 80, no.1, pp. 103 - 124.

Winch, G. and Courtney, R. (2007), 'The Organization of Innovation Brokers: An International Review', *Technology Analysis & Strategic Management*, vol. 19, no. 6, pp. 747 - 763.