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How do innovation brokers orchestrate SME-innovation networks in agri-food?

Maarten H. Batterink^{a, 1}, Emiel F.M. Wubben^a and Laurens Klerkx^b, Emmanuelle Gardère^c,
Françoise Molegnana^c

^a*Management Studies Group, Wageningen University, Wageningen, the Netherlands;*

^b*Communication and Innovation Studies, Wageningen University, Wageningen, the
Netherlands;*

^c*PEACRITT, Région Rhône Alpes, France.*

Abstract

This explorative study of network orchestration processes conducted by innovation brokers addresses new issues in bridging SMEs and research institutes in innovation networks. It includes four in-depth case studies in the agri-food sector from different countries. The guiding research question is how innovation brokers successfully orchestrate innovation networks of SMEs. Based on literature research and cases, we conclude that the innovation broker may have great added value in innovation networks with divergent organizations, especially when the innovation broker takes the lead in three network orchestration functions: innovation initiation, network composition and innovation process management. In addition, the case findings offer best practices of innovation brokers for these orchestration processes.

Key words: network orchestration; innovation broker; small and medium-sized enterprises (SMEs)

¹ Corresponding author. Email: Maarten.Batterink@wur.nl

1. Introduction

In recent years EU, national and regional policies have focused on enhancing the innovativeness of their economies by stimulating inter-organizational cooperation by Small and Medium-sized Enterprises (SMEs). SMEs often lack essential resources and capabilities to successfully innovate exclusively by means of in-house activities (Narula, 2004; Nooteboom, 1994), making inter-organizational networks essential for SMEs that want to innovate. Nevertheless, when they want to establish and benefit from innovation networks, SMEs face several obstacles (Hoffmann & Schlosser, 2001; Kaufmann & Todtling, 2002; Van Gils & Zwart, 2004). The literature that employs the Systems Innovation perspective (Dosi et al., 1988; Malerba, 2002; Nelson, 1993) increasingly pays attention to several types of innovation intermediating organizations (regional and otherwise). Such organizations have arisen to support SMEs; they aim at eliminating the obstacles for cooperation and innovation processes, while stimulating and facilitating these processes (Howells, 2006; Smits & Kuhman, 2004; Winch & Courtney, 2007). For instance, innovation brokers may support SMEs by identifying their innovation needs, articulating the knowledge demands, setting up partnerships and managing the inter-organizational cooperation processes (Howells, 2006). The literature on this topic has provided an overview of the functions that these organizations may fulfil (Howells, 2006; Pollard, 2006; Winch & Courtney, 2007), how they are organized in terms of funding, organizational model, mandate and scope (Klerkx & Leeuwis, 2008b; Kolodny et al., 2001; Van Lente et al., 2003), and how they are embedded within the innovation system (Huggins, 2000; Klerkx & Leeuwis, 2008a; Laschewski et al., 2002). Surprisingly scarce, however, is the empirical knowledge of what defines a useful innovation broker in terms of its organization level impact on the innovation processes of the SMEs (Boon et al., 2008; Sapsed et al., 2007). In their review of SMEs and innovation networks, Pittaway et al. (2004) concluded that the role of such “third parties” in innovation networks has been under-researched (Edwards et al., 2005). Besides systems innovation, management literature has also focused attention on network orchestration processes aimed at innovation (e.g. Dhanaraj & Parkhe, 2006). These studies typically take the position of the commercial firm as focal actor in knowledge acquisition processes, and the establishment of R&D consortia (e.g. Doz et al., 2000). Research still has to “tease out the unique contributions a ‘network orchestrator’ makes, despite of its lack of hierarchical authority” (Dhanaraj & Parkhe, 2006). Or as Winch and Courtney (2007) stated, the question is still open “to identify

how innovation brokers operate, and in which conditions they function most effectively”. As a result, this paper aims to answer the following research question: how do innovation brokers successfully orchestrate innovation networks of SMEs?

In order to analyse the network orchestration processes of innovation brokers, the paper presents both a literature study and four in-depth case studies of innovation brokers, specifically in the agri-food sector. Section 2 reviews the relevant literature on innovation in SMEs, elaborating on the inter-organizational context of innovation. As such, we will discuss the importance of SME-driven innovation networks, how these networks are managed and the role of innovation brokers in these management processes. Then, in Section 3, the methodology of the empirical research is described. Section 4 discusses the findings from the cases and derives propositions. Finally, Section 5 provides conclusions and suggestions for further research.

2. Literature review

2.1. Innovation in SMEs: an inter-organizational process

Our paper deals with the formation and operation of the inter-organizational innovation process of SMEs. The research does not focus on specific innovations, so we use the broad definition of innovation, that of innovation as the “exploitation of new ideas to produce new products, processes, services or business practices” (adapted from DTI's Innovation Report 2003, in Pittaway et al., 2004). With inter-organizational networks, we are referring to cooperative relationships between companies and other actors in which organizations retain control over their own resources, but jointly decide on their use (Brass, et al, 2004). Small and Medium-sized Enterprises (SMEs) are enterprises that employ fewer than 250 people, have an annual turnover below € 50 million, and/or an annual balance sheet which does not exceed € 43 million (EuropeanCommission, 2005).

The topic of innovation in SMEs has received a great deal of attention from scholars (for a review see Edwards et al., 2005). An obvious reason for this attention is that there are many differences between large firms and SMEs in the way in which they deal with cooperation and innovation (Hoffmann & Schlosser, 2001; Nooteboom, 1994; Rogers, 2004). Nooteboom (1994) addressed a number of characteristics of SMEs that can be considered either strengths

or weaknesses for their innovation processes. Well-known strengths of SMEs are motivated management and labour, effective internal communication and little bureaucracy (Nooteboom, 1994). Weaknesses include limited absorptive capacity (Menrad, 2004), lack of functional expertise, diseconomies of scale and the short-term perspective of management (Nooteboom, 1994). These weaknesses are typically cited as justification for establishing relations with external actors. Therefore, it may not be surprising that the majority of SME innovations are developed in cooperation with others (Hulsink & De Jong, 2006).

Research shows that some SMEs experience positive effects from cooperation to achieve innovations, but others experience major problems. The positive effects of cooperative innovation include increased turnover, higher profit rates and expansion of the product range (De Jong & Vermeulen, 2006; Van Gils & Zwart, 2004). Nevertheless, there are several reasons why many SMEs find it difficult to establish and benefit from inter-organizational innovation projects. First, SMEs are often managed by their owners. These entrepreneurs are accustomed to operating independently and within a certain region. Cooperation with other organizations does not come naturally to them (Wissema & Euser, 1991). Second, cultural differences and the lack of joint research experience hamper cooperation (Hoffmann & Schlosser, 2001). For instance, most SMEs are unfamiliar with research organizations (Kaufmann & Todtling, 2002). Third, smaller companies cannot enforce their will upon others. Therefore, SMEs must be confident that the results of cooperative efforts will be allocated fairly (Van Gils & Zwart, 2004). Fourth, typically for SMEs, knowledge may unintentionally spill over to other companies, while intended efforts for knowledge valorization may remain underutilized. Finally, inter-organizational innovation projects may involve companies with divergent institutional and cultural backgrounds. An increase in the number and diversity of the organizations involved adds to the complexity within the project, which in the absence of related expertise among the SMEs, quickly lowers the success rate of an inter-organizational innovation project.

There have been several studies investigating the critical success factors for innovation in SMEs (Edwards et al., 2005) and the related inter-organizational cooperation between SMEs. Most notable is a study by Hoffmann and Schlosser (2001) of 164 Austrian SMEs, which identified the following key success factors for inter-organizational cooperation in SMEs:

- precise definition of rights and duties;
- each partner contributes specific strengths;

- required resources are established;
- alliance objectives are derived from business strategy; and
- speedy implementation and fast results.

Typically, most key success factors such as the decision to cooperate and the design of the partnership relate to the early stages of the cooperative endeavour (Hoffmann & Schlosser, 2001). Other key success factors which have been identified are the need for both roughly equal and non-conflicting interests in the project (Wissema & Euser, 1991). SMEs, however, often lack these key success factors for successful coordination and network management (Hoffmann & Schlosser, 2001). So how are such networks managed, and who is driving them?

2.2. Innovation networks

We have focused on a subset of innovation networks in which a “network orchestrator” (Dhanaraj & Parkhe, 2006) or “broker” (Snow et al., 1992) is the primary actor engaged in the design and management of the innovation network. We adopted the framework of Dhanaraj and Parkhe (2006) who define “network orchestration” as the set of deliberate actions undertaken by a network orchestrator as it seeks to create value with and extract value from the network. Keeping the orchestrator in mind, we must distinguish between network design activities and ongoing network management activities and processes (Dhanaraj & Parkhe, 2006; Snow et al., 1992). In terms of designing a network (the network recruitment process), the network orchestrator has to detail the following three aspects (Dhanaraj & Parkhe, 2006): network membership, network structure and network position. Network membership is specified by the size of the network (number of firms) and the diversity of its participants (a homogeneous or heterogeneous group). Network structure is typified by the density of the networks and their autonomy. Network position relates to the centrality of a firm and its status.

Once the network has been created, the orchestrator may deploy orchestration processes to realize network output. They do this by (1) managing resource mobility, (2) managing value creation and revenue appropriation and (3) managing network stability and development (Dhanaraj & Parkhe, 2006). Managing resource mobility, especially knowledge, includes processes of knowledge absorption, network identification, reinforcing a shared identity (essential for motivating members to participate and openly share valuable knowledge (Dyer & Nobeoka, 2000) and inter-organizational socialization in order to increase social and

relational capital. Through exchange forums and formal and informal communication channels, a network orchestrator can enhance socialization and promote knowledge mobility within the network. Managing innovation appropriation relates to the idea that in the innovation network equitable distribution of value must be ensured and the related concerns must be mitigated. A network orchestrator can facilitate these processes by focusing on trust, procedural justice and joint ownership (Uzzi, 1997). Therefore, organizations engaged in network orchestration must provide leadership in building trust levels and in communicating clear, pre-established sanctions for trust violation. Managing network stability refers to preventing isolation, migration, cliques and attrition. A network orchestrator can enhance a network's stability by using its reputation, by lengthening the shadow of the future, and by building multiplexity (Dhanaraj & Parkhe, 2006).

The framework of network orchestration processes focused on innovation networks is characterized by a small number of participants and is therefore low-density. Although Dhanaraj and Parkhe (2006), in detailing their useful framework, had in mind an orchestrator that takes the position of a so-called commercial hub firm, which indicates high-centrality, we would like to show that their framework of innovation network orchestration processes also fits other facilitative intermediary organizations that are not part of the original network, such as innovation brokers. These innovation brokers may facilitate the design and management of innovation networks.

2.3. The rise of specialized innovation brokers

In management literature, the firms that are described as fulfilling a role as network orchestrator are typically large and dominant firms, e.g. the hub firm that is part of the original network. In the context of innovating SMEs, the situation is rather different as SMEs do not have all relevant capabilities for fulfilling an orchestrating role successfully. Systemic brokers as network orchestrators have been studied from an innovation systems and network perspective. These studies cover inter-organizational SME networking and clustering (e.g. Cooke & Wills, 1999; Major & Cordey-Hayes, 2000; Malecki & Tootle, 1996), and the interaction between research institutes and SMEs (Bougrain & Haudeville, 2002; Isaksen & Remøe, 2001; Izushi, 2003; Kaufmann & Todtling, 2001; Kolodny et al., 2001). Such systemic brokers have been labelled bridging organizations, third parties, brokers, technology transfer brokers, infrastructures or organizations, and boundary organizations. By synthesizing the various definition terms, Howells (2006: 720) proposed the broad term

“innovation broker”. In this paper we follow Winch and Courtney (2007: 751), who define the innovation broker as “an organization acting as a member of a network of actors in an industrial sector that is focused neither on the organization nor the implementation of innovations, but on enabling other organizations to innovate”. Often, these independent brokers also fulfil other roles than network orchestration (Howells, 2006; Winch & Courtney, 2007; Klerkx and Leeuwis, 2008b), although in recent years actors have emerged who concentrate exclusively on network orchestration in the context of SMEs (Howells, 2006). Such dedicated innovation brokers, which principally focus on facilitating innovation by fulfilling the role of broker or mediator between cooperating SMEs, are an especially new phenomenon in the innovation arena of agri-food SMEs (Klerkx & Leeuwis, 2008b). In line with the previously described roles of innovation brokers (Howells, 2006; Snow et al., 1992; Winch & Courtney, 2007), Klerkx and Leeuwis (2008b) identified three basic functions for innovation brokers: demand articulation, network brokerage and innovation process management. Demand articulation comprises diagnosis and analysis of problems and articulation of the needs (latent or otherwise) of SMEs (Boon et al., 2008; Howells, 2006). Network brokerage refers to making external relations available to SMEs (Cooke & Wills, 1999) and finding financing or funding for innovation activities (Kaufmann & Todtling, 2002; Kolodny et al., 2001). Innovation process management primarily relates to enhancing communication and other forms of interaction among partners, which facilitate intellectual property rights and commercialization of innovation outcomes (Klerkx & Leeuwis, 2008b).

As regards the position of such an innovation broker in the network of SMEs and other organizations that are involved in the innovation process (e.g. research institutes), the literature identifies a number of central “values” or “design requirements” that are needed to maintain their position. A key premise of the facilitator role of innovation brokers is an impartial and independent position (Hanna & Walsh, 2002; Hassink, 1996; Isaksen & Remøe, 2001), i.e. one that does not adhere to certain “preferred suppliers” or “preferred development strategies”. In the context of the provision of innovation intermediation services to SMEs, Kolodny et al. (2001) formulated a number of design requirements that they see as essential for proper functioning of innovation brokers: (1) visibility and accessibility to SMEs, (2) trustworthiness for SMEs, (3) access to appropriate sources of knowledge and information relevant to the innovation process, (4) credibility of the innovation broker with these sources, (5) quick response to the requests of SMEs, and (6) complementarity to the weaknesses of the SMEs it serves.

2.4. Towards a research framework

Our research framework was inspired by the innovation network orchestration framework of Dhanaraj and Parkhe (2006), which was primarily developed with a so called “hub firm” as the network orchestrator. In this paper we are concerned with the network orchestration processes of innovation brokers. The set of network design activities, as defined in the network orchestration framework, corresponds to the network brokerage function, as defined in the systems innovation literature. It is here that strategic, complementary partners are scanned and selected, a partnership is developed and procedures and tasks are established. Therefore, we include this process in our research framework. However, we will refer to it as the function of network composition, because it emphasizes the specific function of getting the suitable organizations willing to cooperate within a new network. Moreover, Dhanaraj and Parkhe (2006) refer to the innovation network management process, which comprises the facilitation of knowledge mobility, innovation appropriability and network stability. In this manner, the innovation network management process corresponds to the innovation process management function of an innovation broker identified by Klerkx and Leeuwis (2008b). Innovation process management is the process of creating an atmosphere that stimulates knowledge sharing and learning (knowledge mobility), enabling a fair distribution of the costs and benefits between innovation network members (innovation appropriability) and anticipating and resolving conflicts between the members (network stability). Demand articulation was not put forward as an network orchestration process by Dhanaraj and Parkhe (2006), although it evidently is one of the most important functions of innovation brokers (Howells, 2006; Klerkx & Leeuwis, 2008b forthcoming). It appears to be a core task of such organizations to independently validate new ideas (Winch & Courtney, 2007) and to present good options for SMEs. Therefore, we include demand articulation in our research framework of network orchestration processes and will refer to this process as innovation initiation. In total, we arrive at three main processes of network orchestration that we include in our research framework: innovation initiation, network composition, and innovation process management. The underlying assumption of the research framework is that innovation brokers must have excellent practices for those three processes when they want to orchestrate innovation networks successfully.

3. Methods and data

Because the question under study –how innovation brokers successfully orchestrate innovation networks – is a recent one, a very detailed approach is called for. Miles and Huberman (1994) suggested that researchers should use qualitative research designs when there is a clear need for in-depth understanding, local contextualization, causal inference, and exposing the points of view of the people under study. In addition, Hoang and Antoncic (2003) argued in favour of more qualitative, inductive research into the development of networks of entrepreneurs to stimulate further work by introducing new theoretical ideas. As a consequence, we chose a qualitative and inductive approach in order to identify best practices of innovation brokers, and to arrive at theoretical propositions (Eisenhardt, 1989).

The sampling of the case studies is generally regarded as a crucial element in the case study method (Eisenhardt, 1989; Yin, 2003). The first selection criteria was that the innovation broker aims at stimulating innovation (through cooperation) and economic development of SMEs. The comparability of the cases was enhanced by two additional features of the sample: all of the innovation brokers are mainly active in the agri-food sector and are relatively similar in size (between 5 and 9 FTE). Several innovation brokers that we approached declined participation because of company policy and time pressures. We chose the final set of innovation intermediating companies in our study because we had access as researchers to informants in these organizations. Furthermore, by their nature, innovation brokers are involved in several and sometimes many inter-organizational processes. By accessing these brokers, we were able to extract tacit knowledge from the people with ample experience in inter-organizational cooperation, involving more than 100 SME-driven innovation projects. The general characteristics of the four innovation brokers in our analyses are provided in Table 1.

The issue of internal validity was handled by conducting multiple iterations and follow-ups during the analyses. We addressed the problem of reliability by drawing up detailed case study protocols and by following the required documentation and transcription standards. External validity was increased by studying multiple organizations and analyzing multiple findings. Construct validity was enhanced by triangulation of the data sources. We therefore conducted 18 in-depth interviews (using semi-structured questionnaires) with key actors

(innovation brokers, SMEs and project leaders). The first interview with each innovation broker – the interview with the director or general manager – had a much more open character than the follow-up interviews, which allowed better comparison between the cases (Yin, 2003). In addition to the interviews, we collected internal documents, annual reports, information from the websites, newsletters, etc.

For the analysis of the innovation brokers, we combined interview data with the collected documents. All interviews were tape recorded and fully transcribed. For each innovation broker a detailed within-case description was developed. After this, the cross-case analysis utilized a matrix technique for comparative analysis. The resulting matrices allowed visual identification of differences and similarities in the approaches of innovation brokers. By doing so, we investigated the processes and practices of four innovation brokers: two from the Netherlands, one from France and a German-Dutch cross-border organization. In order to provide in-depth understanding and contextualization, we have included examples from the data (Tables 2-8): these tables provide information on each case beyond that outlined in Table 1 and serve as the basis for the case discussion in the next section.

Table 1: Description of the innovation brokers comprising the sample.

Innovation broker	Year of initiation	Region	Size (FTE)	Legal status	Main source(s) of funding	Type of projects	Number of interviews
KnowHouse www.knowhouse.nl	2003	Southeast Netherlands	9	Public-private	Starting loan from shareholders. Currently operating entirely on the earnings from projects	Very diverse. There is cooperation between several organizations	4
my eyes www.myeyes.info	2005	Mainly the Netherlands, not officially limited to one region	5	Private	Basic capital collected through share emission. Most earnings are directly from projects, many of which have transaction-based business models	Very diverse. Projects in “new commerce”, partnership development, entrepreneurial innovation, start-ups, etc.	5
GIQS www.giqs.org	2001	Mainly Dutch-German border region.	5	Public-private, cross-border	Hardly any structural funding. Most funding is public, mainly based on large EU framework projects	Mainly application based R&D. Relatively large projects, often subdivided into work packages or sub-projects	4
PEACRITT www.peacritt.fr	2001	Rhone Alpes (France)	7	Public	Funding by the region and state (85%) and the EU (15%)	Individual projects aiming at starting innovation at companies; OPTIréseaux - for stimulating knowledge transfer to food processing SMEs; EU projects	5

4. Case discussion and findings

Given space limitations, this section primarily deals with conclusions from the cross-case analysis, but it also provides extensive information on all the individual cases (Tables 2-10). We focus on how innovation brokers create and extract value from their networks by trying to detect commonalities and differences in the organizational characteristics and their roles and practices in the innovation networks. As such, the following sections present results from the qualitative data analysis to explain best practices of innovation brokers in orchestrating their innovation networks. The experiences of the innovation brokers found in this study form the basis for the formulation of the propositions. Our results focus on three main processes of innovation brokers from our research framework (see Section 2.3): innovation initiation, network composition, and innovation process management.

4.1. Innovation initiation

Identifying innovation needs

There are several ways innovation can be initiated. A fundamental aspect is the “prime driver” of a project. An innovation project involving SMEs can be driven by the entrepreneurs, by the availability of certain technologies following research, or by the availability of sources of funding. Hence, innovation projects can be characterized as “SME driven”, “research driven”, or “subsidy driven”. In particular, research-driven and subsidy-driven projects have several drawbacks, most notably that they deliver solutions without a real market potential. Each innovation broker in our study is, therefore, actively concerned with incorporating the needs of SMEs in a project idea. They do this by assisting entrepreneurs or SMEs with demand articulation, i.e. problem diagnosis and specification, articulating innovative ideas, and translating them into knowledge needs and other factors needed for innovation (see Table 2).

KnowHouse emphasizes the importance of SME-driven innovation; they believe this the only means to arrive at “useful” innovation projects for companies. Therefore, *KnowHouse* proactively identifies innovating SMEs, for instance by organizing innovation discussions (cafés) and through intensive socialization with the entrepreneurs. By means of extensive consultation with individual entrepreneurs, the “real” innovation needs can be mapped out.

Both *my eyes* and *KnowHouse* acknowledge the great importance of what they call the “dream stage”. During this stage, SMEs or entrepreneurs can independently develop their ideas without being immediately influenced by limitations and restrictions imposed by funding bodies (governments), research institutes or other organizations. Moreover, they believe that innovation brokers should assess whether the SME possesses a sufficient “sense of urgency” to engage in the innovation. This enables the SME to commit to the innovation network and be open to the necessary changes.

There are several ways GIQS assesses the needs of SMEs. First, during ongoing visits and talks with SMEs, new ideas for projects are acquired. Many projects are part of large EU programmes (such as INTERREG) on a specific theme or topic. Within such a theme, several “sub-projects” are initiated by intensively discussing the options within the GIQS network. The content of these projects results from iterative talks and negotiations between the private and public organizations involved in the project. Second, as the overall project progresses, more specific innovation needs of SMEs are included.

PEACRITT offers a service free of charge, in which a technical expert visits a company in order to analyze the situation and to identify innovation needs. In this way, they try to lower the threshold for SMEs to start innovation activities. Like the other brokers, *PEACRITT* assists SMEs in developing their own ideas, but they also emphasizes that it is important to find a common problem and a common objective in the projects.

With our definition of innovation in mind – the exploitation of ideas – we argue that innovation projects that involve SMEs must truly be SME driven, which implies that the needs and problems of SMEs must be the point of departure for any innovation project. There is a positive correlation between the capability of innovation brokers to identify the real innovation needs of SMEs and the likelihood that the innovation project will lead to commercial success. Therefore we have formulated the following proposition:

Proposition 1a: The effort that an innovation broker allocates to identifying the innovation needs of SMEs positively impacts the network’s innovation performance.

Table 2: Examples from the data for innovation initiation and identifying innovation needs.

Case	
<i>KnowHouse</i>	<p>“We help them (the entrepreneurs) in their ‘dream stage.’”</p> <p>“Entrepreneurs must be enthusiastic. We are not going to pull endlessly.”</p> <p>“There is this example of a programme commission who had to decide about some 40 innovation projects, proposed by an applied research institute. They divided the money between 30 projects, which meant that all projects needed to be downsized, making them ineffective. Now with <i>KnowHouse</i>, the ideas come straight from the sector, and we reduced the number of projects to only a few, but these projects or programmes really answered a question from the sector.”</p>
<i>my eyes</i>	<p>“In traditional innovation projects the first step of an innovation is missing... in our projects we take the time for what we call the ‘dream phase’ to better conceptualize the initial ideas.”</p> <p>“We always look at the ‘sense of urgency’ of an entrepreneur.”</p> <p>“We appreciate novel ideas of entrepreneurs and try to keep them authentic. Many advisory companies try to standardize everything according to their own business models, with the result that the end product is also standard.”</p>
<i>GIQS</i>	<p>“We actively ask companies to get involved in projects. Sometimes that is difficult. We visit them... ask to take a look at the new initiative and ask if they are willing to take part in this project. Or, we ask them if they have new ideas for projects. So it basically goes from both sides.”</p> <p>“They [the SMEs] also need to invest (as with other EU 6th framework programmes, only 50%, of the funding is from the EU). So they really must be willing to do it, because it is partly their own money.”</p> <p>“We have the comfortable situation that at the beginning of a project, we don’t exactly know what we will do. We more or less have a topic and a partner structure. Then we have about six months to define, analyze and plan the pilot project. That is very nice, because there are so many demands, especially since business has different problems than science. And these two worlds have to be brought together. My task is to manage this whole process from the idea stage, to match science and business.”</p>
<i>PEACRITT</i>	<p>“PEACRITT provides situation analysis by a technical expert at the entrepreneurial firm, free of charge, in order to identify the company-specific problems and related knowledge needs.”</p> <p>“In costs little or nothing for entrepreneurs to get involved in potential projects.”</p> <p>“We help entrepreneurs to develop new ideas.”</p> <p>“The added value of the innovation must be self evident for SMEs, it should focus on benefits for the companies.”</p>

Embedding of innovation brokers

Although innovation brokers organize several events in order to meet with SMEs and agricultural entrepreneurs, like innovation “cafés”, workshops or partnership days, and use several promotional means, they also rely on the general networking capabilities of their staff (see Table 3). In this way, these organizations become truly embedded in the networks of the SMEs they target. In addition to becoming visible to SMEs and gaining sufficient trustworthiness to become a realistic option for innovating SMEs (Kolodny et al., 2001), embedding in networks can also help them to identify problems commonly faced by SMEs. For instance, due to its large networks maintained by the employees (most notably the director), *KnowHouse* is able to identify “common problems”, perceive connections with those that could provide complementary assets (e.g. knowledge, funding) and make the necessary links with other actors. *My eyes*, *GIQS* and *PEACRITT* organize specific days for (potential) partners, not only to publicize their services, but also to identify potential problems. For instance, *GIQS* organizes workshops and meetings with several stakeholders to discuss a “common problem”. Such a problem could be one that is of interest for the whole

sector and that serves the public as well (e.g. food safety). GIQS can then use this information to develop more concrete ideas for new projects.

Consequently, to being able to properly formulate the innovation demands of SMEs, innovation brokers must be well embedded in the local business and social networks of the SMEs. We therefore argue that the degree of embedding of an innovation broker positively impacts the network's innovation performance.

Proposition 1b: The degree with which an innovation broker is embedded in the social and business network of local SMEs positively impacts the network's innovation performance.

Table 3: Examples from the data for innovation initiation and network embeddedness.

Case	
<i>KnowHouse</i>	“We meet the entrepreneurs at all kinds of events (social or otherwise) in the region in order to understand their problems and needs.”
	“We organize ‘innovation cafés’, where entrepreneurs gather and engage in networking.”
	“For entrepreneurs, innovation-related activities take place after office hours, in the evenings... KnowHouse visits these companies, also in the evenings.”
<i>my eyes</i>	“Sometimes we hear something from two different people in our network and think they could be brought together.”
	“We organize partner days, where we meet different entrepreneurs, but also other types of actors.”
<i>GIQS</i>	“We organize idea generation workshops where we invite business partners and scientific partners and we have an annual meeting where we try to launch a specific topic or theme.”
	“Especially the director and the other people in the board have a very good network. They are able to speak directly to the right individuals.”
	“We sometimes visit trade fairs and other expert events where we meet businesses, but also scientific people.”
	“We have two people at GIQS who travel a lot and talk to our members and other stakeholders to search for new ideas or to find motivated partners for existing ideas.”
	“We organize a big workshop in September, with all stakeholders. But these activities are limited to two or three times per year, due to the lack of structural funding.”
	“We are also becoming more and more involved in newsletters or events organized by other organizations. Through these events, where we meet many business partners, new ideas reach to our organization.”
<i>PEACRITT</i>	“Many means are used to get SMEs interested in our services, such as PR, newsletters, fact sheets, our website, exhibitions and conference days.”
	“PEACRITT organizes a platform day for sharing ideas. This so called OPTIréseaux day is seen as a good opportunity for exchange that encourages enterprises to formulate ideas and share them with other enterprises, experts and the regional authorities.”

4.2. Network composition

The second main function for the innovation broker relates to network composition. Network composition entails connecting in a systematic manner to complementary actors within an

innovation system. In particular, it entails possessing a heterogeneous network, connecting complementary actors and creating coordination mechanisms.

Connecting with complementary actors from the innovation broker network

It is during network composition that an innovation broker connects SMEs to other organizations, such as firms, research organizations or other actors. In order to make the right connections, the innovation broker must possess a large and diverse network (Dhanaraj & Parkhe, 2006). In this way, SMEs may acquire access to relevant resources, such as technological knowledge or funding. SMEs may find it especially hard to connect with providers of knowledge (technological and otherwise) by themselves. Thus, innovation brokers can be valuable to the innovation process if they have access to and credibility with those sources of knowledge (Kolodny et al., 2001). To arrive at such a network position, innovation brokers must possess strong networking capabilities. This was acknowledged by each of the four innovation brokers in our analyses.

KnowHouse is well connected to the local SMEs (as we discussed in the previous section), but also maintains a strong network with several suppliers of knowledge, most notably the research organizations who are also shareholders in *KnowHouse*. They put a lot of effort into maintaining an extensive network, so they are able to quickly connect to other actors and set up innovation networks. Their network is not limited to the region or the core sector; they also make connections outside the agri-food sector if they are thought to be fruitful. *My eyes* is aware of the fact that many innovation problems require multiple disciplines. As such, they possess the skills and the absorptive capacity to understand complex problems, and to find experts on each discipline and communicate with them. *My eyes* assesses the potential partners' entrepreneurial drive and their willingness to cooperate, as they believe those are crucial ingredients for complementing innovation networks. *GIQS* is strongly embedded in knowledge institutions (its members) and can connect SMEs easily to relevant technical experts. They emphasize that they benefit from the fact that they know the people from the universities, so it is easy to contact them and involve them in projects if needed. Moreover, *GIQS* – like *KnowHouse* and *Peacritt* – maintains strong ties with public authorities, such as local government. *PEACRITT* is also strongly embedded in networks of regional SMEs and is at the same time well connected to all relevant local technical centres and research institutes. This is how they play a crucial mediating role, as the two worlds of research and industry often have different cultures and priorities and are therefore not always easy to connect and

keep connected. From the above data, we have ascertained that the size and diversity of the innovation broker's network are important factors in network composition. Typically, SMEs lack such diverse networks.

The findings also suggest that network membership is not enough for composing a successful innovation network. Innovation brokers also allocate activities to connect the right partners. This means that they include complementary organizations that have an entrepreneurial drive and that are willing to cooperate (also with different kind of actors). Thus, innovation brokers can be especially valuable when connecting different types of actors who have different interests and cultural backgrounds.

Proposition 2a: The size and diversity of an innovation broker's existing network positively impacts the network's innovation performance.

Proposition 2b: The extent to which an innovation broker is able to connect complementary actors positively impacts the network's innovation performance.

Table 4: Examples from the data for network composition

<i>Case</i>	
<i>KnowHouse</i>	<p>“Our foundation is “a knowledge portal” for entrepreneurs. Wageningen University and Research Centre (WUR) is also one of the founders. It is impossible to have a holistic picture of all relevant sciences, but our network is far reaching, and then it is easy to make phone calls. And we have access to the WUR system, including e-mail, intranet etc.”</p> <p>“We often see a broader scope than entrepreneurs, and we see connections... then we know somebody and include them.”</p> <p>“With research institutions it is important that we already know them... some researchers just cannot work together with entrepreneurs.”</p> <p>“It can be fruitful to bring entrepreneurs from different sectors together. Since they are not competitors, and they don't need to cope with status, these entrepreneurs are much more open towards each other, which in turn results in new ideas.”</p>
<i>my eyes</i>	<p>“We have a multidisciplinary approach, and we understand all components. We also have a strong network with specialists for those components. We can bring things together, that is our holistic approach.”</p> <p>“Sometimes we hear something from two different people in our network and think they could be brought together.”</p> <p>“You really need to meet the people in order to make a decision about the project idea. You also have to know if the partner really wants to cooperate.”</p> <p>“We always look at the ‘sense of urgency’ of an entrepreneur. And we look at the setting, and based on our ‘feeling’ we decide what to do...”</p>
<i>GIQS</i>	<p>“When considering partners, we really look within a company at the people.”</p> <p>“We have good connections to people from other departments. But also our connections with public authorities are important. It is not difficult for us to find the specific people.”</p> <p>“At a higher level we also participate in a formal (national) network, called “Kompetenznetze” (competence network), so we are also visible to business and academia through this network. Organizations search these networks for partners in projects.”</p> <p>“GIQS has excellent access to knowledge sources, especially to sources at the universities of Bonn,</p>

Wageningen, and Göttingen.”

“You really have to know the people, and from the people you know the connections continue.”

“In North Rhine-Westphalia, we also have good links to government, such as the Ministry of Agriculture and the Ministry of Science.”

PEACRITT “PEACRITT is well connected to many regional research centres.”

“As an broker organization, we are closer to the industrial world than most research organizations, so we can mediate between industry and research.”

“SMEs usually look for ways to improve economic performance, e.g. consolidation or growth of turnover and jobs. In contrast, academic researchers aim at publication in scientific journals, which requires a partnership with enterprises that are outstanding in the scientific field. An organization like PEACRITT can bridge the gap between the two worlds.”

“We are a kind of ‘door opener’ for SMEs to collectively analyze a problem and facilitate a linkage to technical support.”

Coordination mechanisms

Before an inter-organizational innovation project gets started, appropriate coordination mechanisms (e.g. procedures, tasks and property rights) must be settled in order to prevent members from protecting or hiding valuable knowledge, and to avoid free riding (Dekker, 2004; Dyer & Nobeoka, 2000). SMEs are often unfamiliar with inter-organizational projects, especially regarding the appropriate coordination mechanisms, so this is an area where innovation brokers can typically be valuable. Often, a contract takes care of the relevant procedures, tasks and property rights. On the one hand contracts impose formal coordination of projects, decreasing the level of freedom and creativity. On the other hand, contracts can help innovation brokers and participating actors to prevent other partners from behaving opportunistically. Informal or social mechanisms are often seen as complementary to formal mechanisms (Dyer & Singh, 1998), although such mechanisms take time to get developed.

Within the innovation projects, *KnowHouse* does not heavily emphasize the contract, but it considers the contract more as a backup (see Table 5). *KnowHouse* is able to formulate confidentiality agreements, but when it comes to financial settlements, external expertise is hired. Issues covered in contracts typically include financial matters and elements of confidentiality. Contracts include passages about how and under what circumstances the project can be modified. Generally speaking, none of the partners should be opposed such a change. Issues related to communication or planning are typically not included.

Based on experience with previous projects, *my eyes* concluded that projects without contracts are more likely to fail. As one of the directors said, with the growing mobility of personnel in modern organizations, it is too risky to rely on oral agreements. Therefore, *my eyes* uses contracts in all of its projects. Since *my eyes* has a lot of experience with cooperative projects, they can formulate the contracts themselves (often based on their templates). However, *my*

eyes also noted that a contract can be harmful to the innovation process, as innovation requires a certain level of freedom. Therefore, not too many details should be settled in advance. Moreover, it can take a lot of effort to formulate contracts, especially when they comprise many details, which could be disproportional to the size of the project. Like *KnowHouse*, *my eyes* considers contracts to be a back up or a safety net, comprising as few details as possible. In some projects, *my eyes*' solution to this problem is to include various scenarios in the contract: a best case, a normal case and a worst case scenario. This enables the companies to have a better idea where they may end up in different scenarios. Sometimes, more specific, planning-related elements are also included.

GIQS believes that establishing procedures and standards for a project is one of its most valuable services. By doing so, *GIQS* makes larger EU projects more accessible for SMEs. Moreover, in contrast to the other three innovation brokers, *GIQS* emphasizes formal coordination and administration, as this is often required by the funding bodies. Its contracts usually address property rights, publication rights, reporting procedures (required by funding bodies) and cost-benefit issues. Similar to *GIQS*, *PEACRITT*, organizes good project administration procedures to minimize such activities for SMEs.

Interestingly, confidentiality is a common issue that must be settled up-front by the innovation broker. SMEs seem to be afraid that sensitive information will leak out through the network.

Because innovation brokers typically have extensive experience with cooperation projects, they are able to set up innovation networks with the appropriate coordination mechanisms.

Proposition 2c: The extent to which an innovation broker sets up coordination mechanisms positively impacts the network's innovation performance.

Note that the findings do not indicate that many procedures and tasks should be specified. The proposition refers to the idea that – compared with other actors in the network – an experienced innovation broker is more capable of establishing the most suitable coordination mechanisms, which could just as well be an informal mechanism.

Table 5: Examples from the data for network composition and coordination mechanisms.

Case	
<i>KnowHouse</i>	<p>“Contracts are not very important in our projects, as they are typically rather small.”</p> <p>“We have our own standard confidentiality agreements. When it concerns more financial aspects of the project, we ask for advice from a legal expert.”</p> <p>“I never refer to the contract during projects.”</p> <p>“Planning related issues is not part of these contracts, we also do not formalize the method and frequency of communication.”</p>
<i>my eyes</i>	<p>“If it is useful for the process, then it could be necessary to define planning-related aspects. When a lot of uncertainty is involved, and interactivity and open communication is key, then you should not have too many protocols.”</p> <p>“... it is impossible to work without a contract; the examples I have seen of projects without contracts are not the successful ones... The mobility of people in companies is very high nowadays. So personal agreements are also temporary. Therefore you need a safety net.”</p> <p>“With new things (innovations) it is always difficult. Together with our partners we make sure there is a worst case, best case and normal case scenario. When things go wrong, you know where you stand.”</p> <p>“Who is doing what, what is everybody’s input? How will the benefits be divided? Who owns what when the project ends? What if a company goes bankrupt? Those kinds of elements...”</p>
<i>GIQS</i>	<p>“GIQS often takes the lead in this process. We write the contracts and set up the administrative procedures, the project plan, etc.”</p> <p>“We are familiar with the complexity that comes with large-scale EU framework projects. SMEs don't like the extensive administration that is often required, GIQS makes it easier for them.”</p> <p>“The contracts include issues of property rights, patents, publication, the reporting procedures and financial issues.”</p>
<i>PEACRITT</i>	<p>“PEACRITT provides the enterprises with administrative and financial engineering, which is really important and time consuming for the SMEs (who are always in a rush).”</p> <p>“PEACRITT brings professionalism to the innovation process of agri-food SMEs.”</p> <p>“PEACRITT focuses on the process, other actors are responsible for the content.”</p> <p>“Confidentiality has to be settled in a formal way.”</p> <p>“PEACRITT simplifies the administrative framework imposed by funding bodies on the companies.”</p> <p>“We promote group autonomy, by stimulating co-responsibility and joint decision making.”</p>

4.3. Innovation process management

The interviews clearly showed that all the innovation brokers are involved in innovation process management. It turned out that innovation brokers are primarily concerned with the cooperative aspects of the innovation process. For example, innovation brokers play an important role in resolving conflicts between participating actors. Informal mechanisms – in addition to structural, motivational, and formal mechanisms – also play an important role in preventing conflicts (Dekker, 2004). In the informal context, issues like trust, transparency and openness become apparent. Apart from typical cooperation-related issues in innovation process management, other activities of innovation process management are also taken care of by innovation brokers, such as gate keeping and standard project management and administration. In the context of this paper, we are primarily interested in innovation process management issues that are typical in the inter-organizational context, such as handling conflict, building trust and facilitating network interactions. Such activities appear to suit innovation brokers very well, as they take a somewhat independent position in the network (Klerkx & Leeuwis, 2008a, 2008b).

Leadership in handling conflict

Managing the stability of the network is an important element in managing the inter-organizational innovation process (Dhanaraj & Parkhe, 2006). Ideally, projects and networks should be composed in such a way that conflicts are unlikely to occur (see Section 4.2). But when they do occur, innovation brokers should show leadership in resolving conflicts (see Table 6).

As emphasized by one of the respondents of *KnowHouse*, solving problems and conflicts in the innovation networks is one of its core activities, and is perhaps the most valuable service of *KnowHouse* for the entrepreneurs. Thus, in case of conflicts *KnowHouse* becomes more directly involved in the innovation process and tries to steer the project in the right direction. Surprisingly, conflicts in *KnowHouse*'s projects are often not about sharing the costs and benefits. Perhaps this is due to the fact that most of their projects involve an early stage of innovation, which means that little money has yet been invested by the private companies. The approach of *KnowHouse* can be characterized as a personal one, which means that *KnowHouse* focuses not on the organization, but on the people, which is especially important in the case of conflicts. According to *KnowHouse*, problems related to the cooperation process are especially regrettable reasons to stop a project. One approach *KnowHouse* uses to prevent conflicts is to try to make fully explicit why a party is participating in a project. In essence, *KnowHouse*' "co-innovators" mainly follow their common sense in dealing with conflicts. Besides, *KnowHouse* never refers to contracts during projects. Still, it was found that changing the contract during a project is sometimes necessary, although this can be a very tricky practice.

An important role for *my eyes* in cooperative conflicts is to anticipate these problems, or when they still occur, to resolve them. According to one of *my eyes*' directors, this is at the core of its activities (similar to *KnowHouse*). *My eyes* takes a personal approach and uses techniques such as mediation or dynamic consensus in order to arrive at a setting with minimal conflicts. For *my eyes*, the key to finding solutions for a problem is that they always try to really understand the underlying causes of a conflict or problem. In order to do so, *my eyes* tries to listen carefully to any opinion and tries to understand why people say certain things, or have a certain opinion. Problems can be solved from this perspective. Sometimes *my eyes* has experienced situations where the interests of the companies change (when new, more

interesting ideas come up, or when day- to-day operations become too time consuming). But on other occasions, companies may want to change the contract in order just to shift “the pain” to another party. When the situation demands changing a contract, *my eyes* carefully considers the long-term objective and the importance of a sustainable relationship with the respective partner. It can also be the case that it is better to stop a project, if a company really wants to stop. In the case of conflicts, *my eyes* also tries to look for the things and goals the different people have in common. In this way, *my eyes* tries to take the energy away from the conflict. What really helps here is that *my eyes* is more of an outsider in some projects. In that role, *my eyes* can be considered as a stabilizing factor in the cooperation process. One of the directors emphasized the importance of taking minutes at all meetings, including all decisions made and action plans. These minutes are then distributed to the partners. According to *my eyes*, problems and related conflicts occur due to a lack of openness and transparency, or differences in expectations by the partners. In a following section we will explain the role of openness and transparency in innovation networks.

When conflicts occur, *GIQS* feels responsible to find a solution for it. *GIQS* considers experiences and “lessons learned” from previous projects in improving the structure of new ones. It is the experience of *GIQS* that conflicts in cooperative projects are often of a motivational kind. It sometimes seems difficult to have a partner doing tasks that are not primarily in their own interest. In handling conflicts, *PEACRITT* carefully takes into account the goals of entrepreneurs on the one side and the research institutes on the other side. It may be a challenge to identify and emphasize common stakes of the project, but this is typically something in which *PEACRITT* takes the lead. Balancing the interests of these fundamentally different institutional actors reduces conflicts in innovation networks (Klerkx & Leeuwis, 2008a).

We argue that innovation brokers, due to their neutral position in the network, should take the lead in handling conflicts. In doing so, innovation brokers can have a positive impact on the network’s innovation performance.

Proposition 3a: Leadership by an innovation broker in handling conflicts in innovation networks positively impacts the network’s innovation performance.

Table 6: Examples from the data for innovation process management and dealing with conflicts.

<i>Case</i>	
<i>KnowHouse</i>	<p>“Solving problems is actually our core task... we mainly use common sense in that we do not use specific models... although we seem have our own approach as well.”</p> <p>“We approach people personally, bilaterally, and sometimes tell them they should change their attitude.”</p> <p>“If there are problems in the cooperation process, we pull towards a solution. But if they really want to stop, we will just stop. But if this is a relational problem, and we still see opportunities for the project, we try to solve these problems.”</p> <p>“You really have to look at what is the real reason of a conflict... often there is some distrust. People always expect the other partners to have hidden agendas ... I have the feeling that conflicts are more about something like that, rather than about costs and benefits.”</p> <p>“You really have to understand why people participate in a project.”</p> <p>“In some circumstances, when everyone agrees, we change the contract. The contract often states how and under which conditions things can be modified. Consensus is not always required, as long as nobody is against it.”</p>
<i>my eyes</i>	<p>“This is the essence of <i>my eyes</i> working method, a kind of mediation. You have to show people the common goals in order to get them back together.”</p> <p>“We can be an outsider, which can make it – the innovation network – more stable.”</p> <p>“For example, a recent conflict was caused by different expectations. You first have to determine that this is the underlying cause of a conflict, and then by mentioning the different expectations, you can try and resolve it”</p> <p>“We also use the concept of dynamic consensus. That means that you should make decisions in a democratic way, but you also have to listen to everybody who has a different opinion. Even if it is a conflicting opinion, they have it for some reason and you have to understand that reason. You have to find out which fear or experience is fundamental to the way they act, and why someone has a different opinion.”</p> <p>“You always have to find a solution when there is a conflict, but when a company wants to stop, you just have to.”</p> <p>“If a partner is dissatisfied about something and there are fair reasons for this dissatisfaction, then we change elements in the contract to improve the long-term relationship. However, if it is just a matter of shifting the “pain” towards others or to us, then we cannot accept that.”</p> <p>“There is a large project in which I sometimes refer to the contract, but I realize it can look ‘childish’ to use it...”</p>
<i>GIQS</i>	<p>“In my project, two partners work together who also worked together in a previous project. During that previous project they had a conflict. But they tried working together again in this new project. We first tried to find out what went wrong, what was the problem exactly, without pointing directly at who was responsible. And now in this project we try to organize it differently in order to avoid that problem.”</p> <p>“A typical conflict is that you have defined a different output in the project. It is often difficult to get every output from every partner.</p> <p>“We have to deal with that conflict, because it is also our responsibility that the projects end successfully. Sometimes partners don’t really know what they should do, and then they need more support to define the specific output. We give them such support.”</p>
<i>PEACRITT</i>	<p>“We realize that the objectives of SMEs and researchers are different. In particular, very small enterprises do not look for fundamental or complex innovations, but instead look for technical solutions already approved and tested.”</p> <p>“It is important in a collective setting to have a common problem, so we try to direct the projects towards a common objective’.”</p>

Enhancing transparency

Trust is a phenomenon often considered as one of the basic requirements for successful cooperation in inter-organizational relationships (Bstieler, 2006; Nooteboom, 1999; Uzzi, 1997; Zaheer et al., 1998). Trust can be defined as “a psychological state comprising the intention to accept the vulnerability based upon the positive expectations of the intentions or behaviour of another,” (Rousseau et al., 1998). Several facilitators of trust exist, such as social interactions and transparency between network partners (Bstieler, 2006). Social interactions

within a network, characterized by high-quality communication, create the perception that partners act out of care and concern; it fosters the benevolence and goodwill of the partner (Ring & Van de Ven, 1994), hence generating trust. In this paper, transparency refers to timely, accurate, open and adequate communication among the people in the network, in order to develop a shared understanding, to improve the atmosphere of the relationship and to foster commitment.

According to *KnowHouse*, trust is mainly something that can be enhanced at a personal level (see Table 7). This means that a person engaged in innovation intermediation should be transparent as an individual. This means, according to one of the respondents, that the person representing the innovation broker should present him/herself in a vulnerable way.

Transparency means, among other things, that one should say what one thinks. Also, the partners in the innovation network should act transparently, which means that they should all know what is on everybody's mind. In addition, trust is enhanced by keeping promises and by acting consistently. *KnowHouse* facilitates transparency by making sure that all partners clearly state why they are participating in the project and by being open about situations (problems) not directly related to the project. This could explain why somebody acts in a certain way in a project. This could explain why a problem occurred, since the reason may be something totally unrelated to the project. However, it also appears that some people just "have it" and can stimulate others in the project to be open and transparent. Sometimes a neutral setting (which could be at the location of the innovation broker) stimulates entrepreneurs to be more open as well. *KnowHouse* believes that the internal organization should also be transparent. According to one respondent, the colleagues at *KnowHouse* are also very open towards each other, in a personal way. Also in the projects – each run by one of the co-innovators - the participants should share their problems because this leads to new ideas and solutions.

Openness towards all partners and transparency in all processes play important roles in the success of *my eyes*. As stated on their website, *my eyes* believes "you should be open about what you do and about your beliefs". Moreover, a lack of transparency is fundamental to many problems in cooperation. For instance, according to the experience of *my eyes*, problems occur due to differences in expectations (caused by an unintended lack of transparency about the expectations), hidden agendas (a deliberate lack of transparency) or

because of “unasked questions” (lack of openness due to dependencies). According to one of the directors of *my eyes*, openness is also about being fair about what you do yourself. If a project appears to be going wrong, you should have the courage to acknowledge your own role in this situation. Similarly, in the case of success you should consider whether you can really take credit, or whether it was due to something or someone else.

By asking many questions during project meetings, *GIQS* forces the various partners to really think about the project and explicitly state why they do certain things in certain ways. In this way, *GIQS* tries to make it clear if there are problems, hidden or otherwise.

Finally, transparency could also refer to previous acts and achievements. In that regard, *GIQS*, *my eyes* and *PEACRITT* emphasize that it is very important to show track records of past successful projects to SMEs. The innovation brokers also stated clearly that in ongoing projects it is important to present results at an early stage. Moreover, *PEACRITT* and *KnowHouse* structurally include small, go-no go decision moments, which implies that the various decision moments concern relatively little money. As a result, these small go-no go decision moments make the components of innovation effort in innovation networks transparent and comprehensive enough for each member. In this way, little-by-little, trust will be enhanced just enough to go one step further. At a later stage, when there is more trust, entrepreneurs will be more willing to invest, since the partners will have more confidence in the overall project. This can be facilitated by visits to test sites.

We argue that innovation brokers can play a crucial role in the innovation network by enhancing transparency in the actions of individual partners and the joint innovation activities. Based on the above findings, we have formulated the following proposition:

Proposition 3b: The higher the level of transparency between the network partners facilitated by an innovation broker, the better the network's innovation performance.

Table 7: Examples from the data for innovation process management and facilitating transparency.

<i>Case</i>	
<i>KnowHouse</i>	<p>“It is always important that in an early stage parties communicate explicitly why they are participating in the project, but normally that takes quite some time. That also makes it easier to settle the financial issues.”</p> <p>“Sometimes it takes 1.5 years before you really understand why somebody is involved in a project.”</p> <p>“There was this example in a project where somebody often changed his standpoint, without clearly explaining why...we thought it had to do with the company succession (father-son). But it was incredibly difficult for this guy to explain something like that in the group (with other entrepreneurs). We addressed that issue in the group. That helped.”</p> <p>“Only by being open towards each other, can you trust each other. You must be able to discuss anything, including personal things. As a consequence, we have a working method that we included in our projects. But if you want to work like that in external projects, you must make sure this openness is also present inside your organization,”</p> <p>“It starts with people. We are very transparent in everything we do, and we always keep our word. You must also trust the other people, that means that you have to present yourself in a vulnerable way. Being open and transparent means that you have to say what you think. Also when we see or hear something strange in a meeting, we ask about it straightaway.”</p> <p>“When we work with people in the projects, we try to get to the people themselves. We have to know what is going on in their normal lives, because those elements influence how they function in cooperation with others. We try to make those personal things transparent as well. But sharing each other’s personal matters is something that takes some time before it starts.”</p>
<i>my eyes</i>	<p>“Unasked questions sooner or later result in problems.”</p> <p>“Projects often fail, or fail to get started, because of hidden agendas...it is a challenge to be open and fair”</p> <p>“If something goes wrong in a project you should look at yourself first to see if you have a role in this... And when things go well, people assume it is due to their efforts,... but is it really? You should be honest with yourself... but this goes against the nature of most people.”</p> <p>“You should be able say what you want (in a cooperative project), similar to the situation where you are the boss. Often, however, dependence is created between the participant with the idea and the financier. That is deadly for a project. The one with the idea cannot say what he/she really thinks, which limits the potential of the idea.”</p> <p>“It is a matter of both feeling and common sense. In addition, you have the facts. And increasingly, we are able to show evidence of what we can do. And it is very important to meet each other personally.”</p> <p>“When it comes to trust, I always consider the individual – can I trust them or not?”</p>
<i>GIQS</i>	<p>“I ask a lot of questions, because I don’t understand everything. Sometimes that seems stupid to them, but with my questions, they also know at the end what the problem is. So it helps to define problems as well.”</p> <p>“Trustworthiness for SMEs depends largely on your track record, but also on our people. In the beginning it was quite difficult. Now, we have a good reputation – which is that they believe we can improve cooperation and building partnerships, and that we really add value. This makes it easier.”</p>
<i>PEACRITT</i>	<p>“In the collective efforts it is important that there is a situation where individual problems are openly discussed.”</p> <p>“We try to valorize success stories by systematically presenting results from projects.”</p> <p>“In our framework of collective projects, there are visits to participating companies or study trips. The companies become more aware of the possibilities that come with the project, and they experience that the project is becoming more realistic.”</p> <p>“In reporting as well, you need to be open and honest.”</p>

Network interactions

In innovation networks, the way partners interact and communicate is said to be an important factor for success, because interaction between network partners enhances trust (Bstieler, 2006). Innovation brokers may be very helpful in mediating between the two worlds of industry and research, who have different mind sets, expectations and time frames. In this regard, innovation brokers may act as a translator or mediator (Klerkx & Leeuwis, 2008b) to

facilitate a situation that enhances knowledge mobility (Dhanaraj & Parkhe, 2006) and subsequent learning.

KnowHouse' main means of communication is the telephone, since this seems to be most appropriate when dealing with the entrepreneurs (see Table 8). The frequency of interaction differs greatly for each project and according to the situation. For instance, if there are problems, *KnowHouse* maintains very frequent contact, telephoning several times per day. If there are no problems or urgent matters, the communication frequency may go down to once per week. Although *KnowHouse* uses the telephone a lot for communicating during the projects, meetings are also required. During these meetings, information is exchanged in such a way that everybody is up to date, so that the more important decisions can be made. If there is a specific problem in the cooperation process, all participants are called in for a meeting. Such meetings are necessary to solve the conflict or problem. *KnowHouse* is especially effective in mediating the interaction between researchers and entrepreneurs in the projects, as they are aware of the different cultures and the resulting potential for problems in communication.

My eyes uses several means for communication and interaction between partners, including telephone, e-mail, digital document sharing, video conferencing, workshops, etc. Meetings, with partners coming together at one physical location, remain crucial for *my eyes*' projects. *My eyes* has facilities for such meetings. Sometimes an independent party is included to chair the meeting, and sometimes an external expert is included, who can add a new perspective to the project. The frequency of interaction, or the number of contacts, differs for each project. Because meetings take a lot of time, and travel is often required, *my eyes* believes they should not be held too often. In addition, *my eyes* plans meetings very carefully, with clearly defined goals. In some projects, *my eyes* makes agreements beforehand about the means and frequency of communication. An important feature of *my eyes* services are tools that facilitate inter-organizational cooperation, based on ICT.

GIQS emphasizes that it is important that partners actually meet each other face-to-face. Therefore, *GIQS* organizes meetings with all project partners. *GIQS* also often moderates such meetings. As an outsider they can not only evaluate the overall objectives of a project, but also take account of the individual interests.

Finally, both *GIQS* and *PEACRITT* note that it is important that an innovation broker responds quickly to the SMEs, whereas research institutes often take much more time. It appears that innovation brokers are aware of the differences between different types of partners in communication and interaction. Consequently, they are in a good position to stimulate the interaction so that there is a good platform for learning.

Indeed, from the cases we have ascertained that innovation brokers are very concerned with interaction processes in the innovation networks and that they take the lead in facilitating interactions between the network members, who often represent different types of actors with different timeframes and cultures.

Proposition 3c: The more interaction between network members facilitated by an innovation broker, the better the network's innovation performance.

Table 8: Examples from the data for innovation process management and inter-organizational interaction.

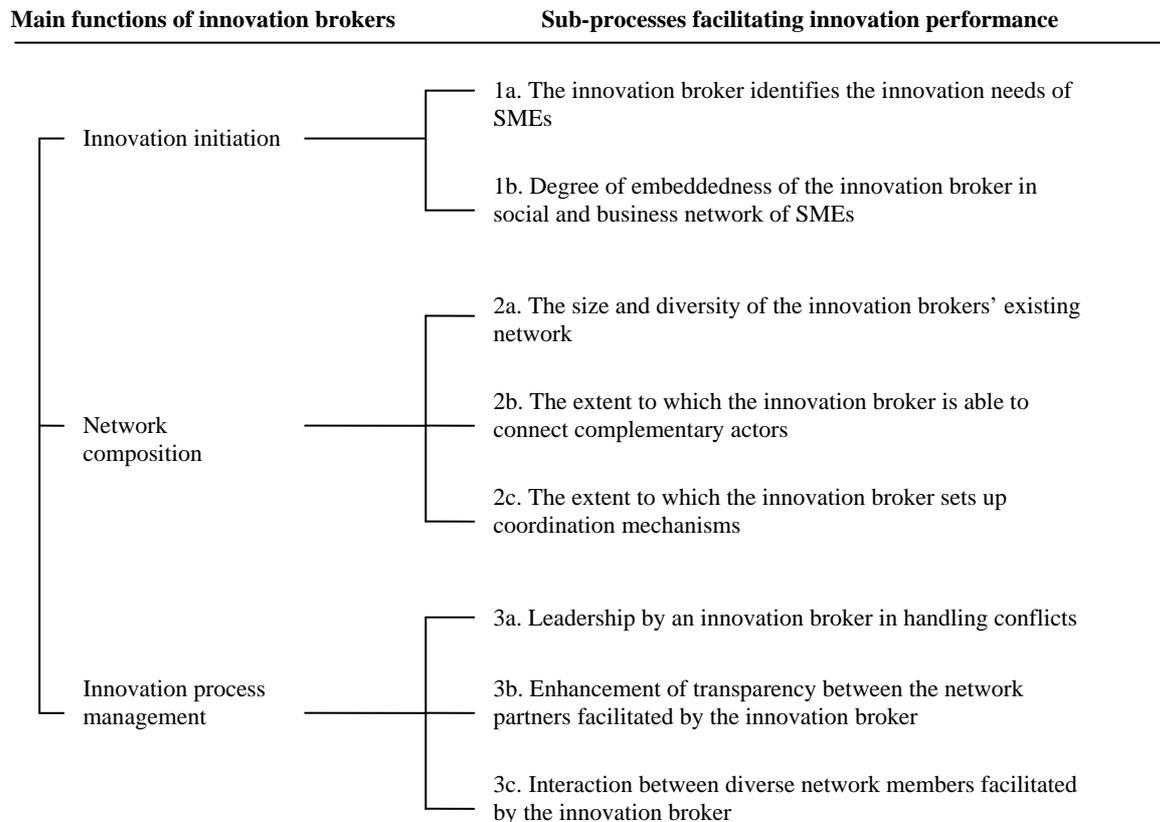
<i>Case</i>	
<i>KnowHouse</i>	<p>“We just use the telephone a lot... that just seems to work best”</p> <p>“Depending on the project, the frequency differs... also, when there are problems we make contact several times per day, but if a project runs well, once per week may be sufficient.”</p> <p>“Meetings are about synchronizing, about making some decisions... many things can be settled on the phone, but at sometimes you just have to sit around the table.”</p> <p>“There are regular meetings about the progress, and there are meetings when there are problems... then, the agendas and the objectives are totally different.”</p> <p>“When a researcher from a research institution is included, he/she needs to participate in the process with the entrepreneurs.”</p>
<i>my eyes</i>	<p>“We use all kinds of interactive means of communication: video, individual, workshops, games – whatever may be necessary. In general we have an informal way of communicating, but we also realize that formal communication is needed, especially with the feedback.”</p> <p>“Real physical meetings are also very important, but this requires a lot of time as well. You need to find a balance.”</p> <p>“Project meetings should always have a goal, which we determine beforehand. It can really benefit the meeting if there is an independent party who leads or chairs the meeting.”</p>
<i>GIQS</i>	<p>“<i>My eyes</i> developed ICT tools especially to facilitate inter-organizational cooperation.”</p> <p>“You have to respond quickly to SMEs, but you should also be careful with potential information overload.”</p> <p>“Business partners have a lack of time, so it is really hard to contact them. Often I call them on the mobile phone and ask about the project, and I e-mail them.”</p> <p>“To a certain extent, I can guide the discussion so that progress is made during the meetings. I take minutes, I organize the agenda and the topics, and I try to moderate the meetings, to keep the overall aim of a meeting in mind.”</p> <p>“It is very important that partners physically meet each other. It is not easy to build trust by only communicating by e-mail and telephone. For us it is important to have a meeting with all partners at least every six months, so that everybody knows what is going on, what the problems are and so on. They just share their knowledge better that way.”</p> <p>“You can't compel trust, it grows in time. Meetings and social events are important, and it is quite important that all the partners visit each other. But it is sometimes complicated to meet each other all together, people need to travel.”</p>

PEACRITT “The ideal is to answer the SMEs within three days of their request. But it depends on the time of year, some times are more problematic for us than others.”
“...save time for training and mutual knowledge exchange.”
“Peacritt offers a platform in which different types of actors interact, analyse common problems and consider joint solutions.”
Our role of ‘translator’ is very important in complex partnerships that comprise a varied set of actors from different worlds... We build a bridge between those worlds and try to develop a ‘common language’.”

5. Conclusions

This paper addresses the problem of SMEs finding successful ways to innovate in a partnership and determining the successful practices for innovation brokers to orchestrate such innovation networks. As such, our in-depth study of four innovation brokers makes a welcome contribution to the existing literature on innovation networks and innovation brokers as it addresses the call for studies of the actual practices of successful innovation brokers (Sapsed et al., 2008: 1329). Based on three main functions for such innovation brokers in orchestrating innovation networks – innovation initiation, network composition, and innovation process management – eight propositions were developed, each accompanied by numerous best practices identified from the cases. Our results indicate that innovation brokers contribute to the innovation performance of a network when they engage in a number of network orchestration processes (see Figure 1). Innovation brokers orchestrate innovation initiation by identifying the actual innovation needs of SMEs (Proposition 1a) and by being strongly embedded in the social and business networks of the SMEs (Proposition 1b). Innovation network composition can be successfully orchestrated when innovation brokers possess a large and diverse network (Proposition 2a) and by the extent to which an innovation broker is really capable of connecting with complementary actors (Proposition 2b). Moreover, network composition can be further enhanced by innovation brokers (due to their experience in cooperative efforts) by setting up appropriate coordination mechanisms (Proposition 2c). Innovation brokers typically play a core role in handling conflicts that accompany the inter-organizational processes, thereby orchestrating the actual innovation process (Proposition 3a). Additionally, innovation brokers orchestrate the innovation process in networks by facilitating transparency (Proposition 3b) and enhancing interaction between network members (Proposition 3c).

Figure 1: Innovation broker-related determinants of innovation networks performance



It should be noted that our theoretical framework for orchestrating innovation networks by innovation brokers is not conclusive. First of all, the four in-depth case studies could have missed important elements of innovation network orchestration. Second, due to the space limitations that accompany a scientific paper, we could not elaborate on every sub-process. However, our results do confirm the findings from existing literature on innovation networks and innovation brokers. For example, we found that innovation brokers help to initiate innovation networks by facilitating articulation options and demand; they do this by searching for, delineating, filtering and matching cooperation partners, and by guiding the actual cooperation during the innovation process. This corresponds with the findings of Sapsed et al. (2007) and Klerkx and Leeuwis (2008a). Our findings also correspond with the proposals of Boon et al. (2008). In their study of the orphan drugs sector, they proposed several techniques for supporting continuous demand articulation an innovation co-production, such as consultation, mediation, coordination deliberation and co-production. Further research should make clear if our study on innovation brokers in the agri-food industry is also relevant to other sectors or other types of diverse networks.

We did not specify possible interactions, but it may be self evident that, due to non-linear practices, project initiation, network composition and innovation project management interact with each other. Although these processes represent sequential stages in the innovation process, it is clear that, for instance, the way an innovation project is initiated may impact the composition of the network. Because the knowledge demand of an SME is well articulated by an innovation broker, the best complementary partners can be sought in the existing networks of the innovation broker. Moreover, a well-composed network can be regarded as the basis for a successful innovation process.

The generalizability of the propositions is limited by the relatively small size and scope of the sample. Larger-scale empirical efforts are necessary to statistically assess the relationships presented here and to help define the contexts in which these relationships vary. Moreover, given the complexity of inter-organizational innovation processes of SMEs, the results of this study could vary significantly between different countries and different institutional settings. We recommend quantitative studies, both at the level of innovation networks (comparing networks that are being orchestrated by an innovation broker with networks that are not) and at the level of the innovation broker (comparing different types of innovation brokers and the impact of certain organizational characteristics on performance). Moreover, how innovation brokers function in different types of innovation networks (with respect to structure: density, centrality and size) is another theoretical issue that should be investigated further, since the structure of a network may impact the network orchestration process (Dhanaraj & Parkhe, 2006).

Policymakers can take into account the best practices identified in our study when they establish innovation brokers as an instrument to stimulate innovation of SMEs, regional or otherwise. However, this does not mean that a general template for the design of an innovation broker can be used when one wants to establish a new innovation broker. As was explained during one of the interviews: *“If you want to set up something similar to our organization in a different region, you should make sure it is independent from how it is set up here. You really have to consider the dynamics of the region and set it up accordingly.”* This corresponds with arguments forwarded by Tötödling and Trippel (2005) that copying a successful recipe for innovation support is unlikely to be feasible, and that context-specific interventions must be designed. Nevertheless, our case study findings are derived from a

number of successful innovation brokers with rich experience in inter-organizational processes. It could therefore serve as a starting point for further research into the domain of orchestration processes in innovation networks of SMEs.

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Appendix 1: Description of the four innovation brokers studied.

KnowHouse

KnowHouse, which began operations in 2003, presents itself as a facilitator of innovation, specifically aimed at stimulating innovation in the agri-food sector in the south-eastern part of the Netherlands (North Limburg). It can be characterized as a “pure” innovation broker (Klerkx & Leeuwis, 2008b). *KnowHouse* started operations in 2003. As of June 2007, *KnowHouse* employed 9 FTEs, 5 as “co-innovators” involved as brokers in innovation projects, and 4 as support staff. *KnowHouse* is currently involved in about 30 projects, and has been involved in more than 100 projects since its beginning. *KnowHouse* has public shareholders (e.g. local governments, universities) and private shareholders (e.g. privatized research institutes, banks, agricultural supplies companies). Although *KnowHouse* obtained starting capital from its shareholders to bridge over the first three years, these days the company’s turnover comes directly from the innovation intermediation activities it conducts for its clients. *KnowHouse* carries out activities for demand articulation, network composition and innovation process management.

my eyes

Officially founded in September 2005, *my eyes* started operations in April 2006. The company is not a “pure” innovation broker, although it carries out specific intermediation functions; *my eyes* also offers specific knowledge intensive services, such as ICT support. As of June 2007, *my eyes* employed 5 FTEs and was involved in about 30 projects (also including unpaid projects). It is the mission of *my eyes* to bring producers and consumers closer together by making and facilitating the necessary connections. The company is directed by 3 individuals who hold some, but not the majority, of the shares. *My eyes* also has a certificate structure with B-shares, which are held primarily by *my eyes* partners (in projects and networks). Of the 5 FTEs currently employed at *my eyes*, only 2 are on the payroll. The other employees can be seen as entrepreneurs who should be able to earn directly from the company’s activities and projects. Although the head office is located in the Dutch province of Gelderland, the company does not have a specific regional focus. *My eyes* carries out activities for demand articulation, network composition and innovation process management.

GIQS

GIQS focuses on facilitating cross-border public-private partnerships between Germany and the Netherlands. Its two parent organizations are the University of Bonn and Wageningen University. *GIQS* has 5 employees, 3 appointed by *GIQS* and 2 who are “virtually appointed” through the university of Bonn. *GIQS* has about 30 official member, of which most participate or has participated in projects. The core funding for *GIQS* is only €15,000. In terms of funding and cooperation, *GIQS* is active in complex projects such as large EU INTERREG frameworks of cooperation. *GIQS* “translates” complex projects into smaller projects or work packages that are accessible to SMEs. *GIQS* is involved in the entire life cycle of the projects. *GIQS* mainly carries out activities for network composition and innovation/partnership process management.

PEACRITT

The mission of *PEACRITT* is to improve economic development of the agri-food sector in Rhône-Alpes (France) through various activities aimed at SMEs and other stakeholders. *PEACRITT* functions primarily as a broker between SMEs and knowledge institutes, and in addition, is involved in training SMEs in the fields of innovation and cooperation. *PEACRITT* employs 7 FTE and is involved in a substantial number of regional projects. An important feature of *PEACRITT* is a programme called “OPTIréseaux” (Opti-network), which focuses on themes related to innovation and technical or organizational development. An OPTIréseaux programme comprises a minimum of 6 and a maximum of 12 SMEs. The companies forming an OPTIréseaux programme are supported by at least two experts from technical centres or other research institutes. *PEACRITT* safeguards the OPTIréseaux concept, and takes the role of coordinator and facilitator between the experts and the enterprises. The activities of *PEACRITT* in an OPTIréseaux programme involve individual elements (diagnostics of the project for each involved enterprise, technical assistance, training in the enterprise, engineering) and collective elements (connecting the enterprises in the OPTIréseaux network). *PEACRITT* is a non-profit organization which relies completely on public funding, mainly from the regional and national governments. Members pay a small contribution. *PEACRITT* is also involved in European projects, making them accessible to regional SMEs.