

# **Knowledge Angels: fostering innovation in knowledge-intensive business services through creative individuals**

**-Observations from Canada, China, France, Germany and Spain**

**Emmanuel Muller<sup>1,2</sup>, Andrea Zenker<sup>1</sup>, Jean-Alain Héraud<sup>2</sup>**

<sup>1</sup>Fraunhofer Institute for Systems and Innovation Research (Fraunhofer ISI), Karlsruhe (Germany)

<sup>2</sup>Bureau d'Economie Théorique et Appliquée (BETA), Université de Strasbourg (France)

October 2012

Accenture award for research papers in Economics and Management of Innovation,  
Autonomous University of Madrid and Accenture, March 2013

**Emmanuel Muller** is economist, specialized in innovation and knowledge economics. He holds since 2001a professorship at the University of Applied Sciences Heidelberg (Germany). He coordinates since 2009, the evoREG initiative devoted to innovation policy and research in the Upper Rhine and associating the Bureau d'Economie Théorique et Appliquée (BETA, University of Strasbourg, France) and the Fraunhofer Institute for Systems and Innovation Research ISI (Karlsruhe, Germany). Apart from teaching and publishing in the fields of innovation economics, management and policy he is performing contract research mainly on the issues of regional innovation systems, knowledge-intensive business services (KIBS) and creative economics.

**Andrea Zenker** is geographer, specialized in innovation economics and regional innovation. She is working as researcher and project manager at the Fraunhofer Institute for Systems and Innovation Research ISI in Karlsruhe (Germany). She received her PhD in 2007 at the Université de Strasbourg, Faculty for Geography and Development. Andrea Zenker is engaged in contract research in innovation economics, regional innovation systems and strategies, and knowledge economics. Her recent research and publication activities focus on creativity, knowledge-intensive business services, German-French research cooperation and innovation systems.

**Jean-Alain Héraud** is economist, Professor at the department of economics of Université de Strasbourg. Former Director of BETA and former Dean of the faculty, his research interest deals mainly with: evolutionary economics, regional innovation-based development policies as well as science policies. He is engaged in the governance of the Upper Rhine French-German-Swiss academic cooperation. Over the years he served as expert for various institutions, countries and international institutions.

## 1 Introduction

In this article we start from the commonly accepted concept of KIBS (Knowledge Business Intensive Services) – while underlining the central role of such economic actors in the development of territories through the innovation process of firms – before introducing an additional concept, the “knowledge angel”. Under this name we consider a crucial actor in the system of the KIBS in relationship with its clients, a type of creative knowledge broker responsible for most of KIBS' efficiency in the global innovation process.

As for the KIBS, the best way to present them is to cite the author who contributed the most to the concept: *"In many ways, what they are doing is locating, developing, combining and applying various types of generic knowledge about technologies and application to the local and specific problems, issues and contexts of their clients (...) they are involved in a process of fusing generic and local knowledge together"* (Miles 2005: 45).

From today's perspective this sentence may summarize almost twenty years of efforts devoted by scholars to research on KIBS. To sum up, they deliver the important functions of exchanging and increasing the volume and quality (relevance) of technological knowledge among firms, but also of other types of tacit and formal knowledge leading to innovation in specific contexts (territories, sectors, etc.). KIBS contribute to global innovation by many ways, like the diffusion of innovative practices or the improvement of absorptive capacities at their clients' level. But innovation takes place at their level as well, and this is the focus of the present article.

In the economic and managerial literature, a lot of work has been devoted to the understanding of KIBS' influence on the innovative capabilities of the clients, and not so much on their own innovation process. We want to contribute to the latter issue, stressing the role of specific high skilled individuals: the Knowledge Angels. We aim at filling a real research gap since almost no effort has been done to enter the KIBS "black box".

To a large extent, KIBS-related innovations are co-constructions between manufacturing and service firms. Knowledge angels crucially contribute to such a reciprocal catalytic relationship. Their role is to trigger and/or to implement the creative knowledge broker function of the KIBS, both internally and externally. In the characterization of this role we can also refer to the concept of *gatekeeper* developed in the literature of knowledge management (see Hargadon and Sutton 1997) and underline their capacity to "bridge" different *communities* (in the sense of Cohendet and Simon 2007). We intend

to show that KAs are more than ordinary knowledge brokers, because they play their role not between but within at least two organizations.

The next section (2) of the paper presents a survey of the literature on KIBS and their contribution to innovation, with a stress on the lack of information about the internal sources of creativity. Then we present our empirical observations (3) with an exploratory methodology of enquiry. Five national contexts are explored (Canada, China, France, Germany and Spain). A comparison is made between the concepts of knowledge angel and business angel. The fourth section deals with some implications of the research in terms of concrete strategies and policies for different actors at different levels while the last section (5) aims at summarizing the conclusions of the investigation.

## 2 Forging a new concept

In this section, starting from the literature on KIBS (section 2.1) and considering their role in innovation processes (section 2.2), we stress the lack of information about the internal sources of creativity of KIBS in the analyses performed previously on KIBS and innovation (section 2.3).

### 2.1 The starting point: what are KIBS?

In general terms, KIBS are mainly concerned with providing knowledge-intensive inputs to the business processes of other organizations, including private and public sector clients. Miles et al. (1995) identified three principal characteristics of KIBS:

1. They rely heavily upon professional knowledge;
2. They *either* are themselves primary sources of information and knowledge *or* they use knowledge to produce intermediate services for their clients' production processes;
3. They are of competitive importance and supplied primarily to business.

In more precise terms, Miles et al. (1995: 18) defined KIBS as 'services that involved economic activities which are intended to result in the creation, accumulation or dissemination of knowledge'. Another general definition is provided by Toivonen (2006: 2), who defined KIBS as 'expert companies that provide services to other companies and organizations'. In addition, den Hertog (2000: 505) suggested an even more precise definition of KIBS: 'private companies or organizations who rely heavily on professional knowledge, i.e. knowledge or expertise related to a specific (technical) discipline or (technical) functional-domain to supply intermediate products and services that are knowledge based'. Finally, Bettencourt et al. (2002: 100-101) defined KIBS as 'enterprises whose primary value-added activities consist of the accumulation, creation, or dissemination of knowledge for the purpose of developing a customized service or product solution to satisfy the client's needs'.

Thus, three core elements may be derived from these definitions. First, the term "business services" is related to those specialized services demanded by firms and public organizations and not produced for private consumption (Strambach 2001). Second, the expression "knowledge intensive" can be interpreted either in terms of labor qualification (Miles 2005) or in terms of the conditions for the transactions between the service provider and the service user or procurer (Hauknes 1999). Third, the term "knowledge intensive firms" refers to firms that are undertaking complex operations of an intellectual nature where human capital is the dominant factor (Alvesson 1995).

While the definition of KIBS may be debatable, Wong and He (2005: 2) stated that: "*KIBS provides a platform to study group of services which is very actively integrated into innovation systems by joint knowledge development with their clients*". In this schema, the term KIBS has been used to refer to service firms that are characterized by their high knowledge intensity and the orientation of their services to other firms and organizations, services that are predominantly non-routine. Miles et al. (1995: 29-30) proposed a working definition of KIBS, distinguishing between 'traditional professional services (P-KIBS)' and 'new-technology-based services (T-KIBS)'. P-KIBS are '*traditional professional services, liable to be intensive users of new technology (business and management services, legal accounting and activities, market research, etc.)*'. T-KIBS are mainly related to information and communication technologies as well as technical activities (IT related services, engineering, R&D consulting, etc.). However, some sub-sectors of activities corresponding to services and displaying similar features (high levels of qualified labor and the use of new technologies) are usually not considered as KIBS. For instance, services such as health care related services and specialized services related to resourced-based sectors (agriculture, forestry, mining and gas extraction) are not identified as KIBS.

Thus, there is no standard approach and accepted definition of KIBS (Wood 2002). However, a certain consensus exists about the branches and firms belonging to the KIBS sector. The nomenclature here often follows the NACE (Classification of Economic Activities in the European Community), which has proven increasingly popular in identifying KIBS, at least in Europe: KIBS as a sector comprises - amongst others - computer and related activities, research and development, and other business services. . Table 1 depicts the composition of the different sectors and sub-sectors defining KIBS.

**Table 1: KIBS sectors and sub-sectors**

<b>NACE</b>	<b>Description</b>
72	Computer and related activities
721	Hardware consultancy
722	Software consultancy and supply
723	Data processing
724	Data base activities
725	Maintenance and repair of office, accounting and computing machinery
726	Other computer related activities
74	Other business activities
741	Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; holdings
7411	Legal activities
7412	Accounting, book-keeping and auditing activities; tax consultancy
7413	Market research and public opinion polling
7414	Business and management consultancy activities
742	Architectural and engineering activities and related technical consultancy
743	Technical testing and analysis
744	Advertising
7484	Other business activities n.e.c.

Source: Adapted from Muller (2001, p.79).

## 2.2 Why are KIBS important to innovation and how should they be investigated empirically?

Research on KIBS has been carried out since the middle of the 1990s. Broadly speaking, the development of studies in this field has evolved and is characterized by three main phases of development.

The first phase includes mainly theoretical reflections – with little empirical concern – recognizing KIBS as a peculiar sector. Miles et al. (1995) proposed the first detailed elaboration of KIBS following (and inspired by) the works of Barras (1986; 1990) on the use of ICT in services as well as the taxonomy of services by Soete and Miozzo (1990). These seminal studies stressed that KIBS, compared to others branches of services, form a category of service activity *"which is often highly innovative in its own right, as well as facilitating innovation in other economic sectors, including both industrial and manufacturing sectors"* (Miles et al. 1995). This recognition, in turn, has stimulated significant subsequently research efforts.

The second phase provides a deeper empirical analysis of KIBS with regard to two specific questions: (i) do KIBS innovate? and (ii) do KIBS innovate differently from manufacturing? The most important development that has contributed to the understanding of the innovation process and innovative patterns has been the implementation of the Community Innovation Survey (CIS)<sup>1</sup>. This survey was developed to collect micro-level data on the innovation activities of firms. It includes questions dealing with innovative processes as well as innovative performance. Studies based on CIS data focus mainly on topics such as patterns of innovation and sources of competitiveness (Camacho and Rodriguez 2005; Evangelista 2000; Hollenstein 2003; Tether 2003; Tether and Hipp 2002), innovation and sectoral performance (Cainelli et al. 2004; 2006; Evangelista and Savona 2002; 2003), and innovation and inter-firm collaboration (Tether 2003). When addressing KIBS, these papers focus essentially on the innovation activities of KIBS within national frameworks only. In parallel, scholars have developed their own database based on relatively large scale surveys directed towards KIBS and sub-sectors in order to provide a comprehensive picture of the innovative patterns of KIBS (Balaz 2003; Djellal and Gallouj 2001; Freel 2006; Koch and Stahlecker 2006; Koschatzky 1999; Leiponen 2005; Muller 2001; Tether 2005; Wong and Singh 2004). These surveys draw heavily, in style and substance, upon OECD manuals and the CIS methodology. The empirical studies on KIBS are still far from being conclusive regarding the distinctive features of innovation in this sector. However, results from the litera-

---

<sup>1</sup> The first CIS was performed in 1993 and was then carried out in 1997 and 2001. For more detailed information on the CIS, see Smith (2005).

ture reveal that KIBS are major innovators. There is certainly recognition that innovative activities in KIBS are distinctive from those in manufacturing firms (Camacho and Rodriguez 2005; Freel 2006; Gallaher and Petrusa 2006; Sundbo and Gallouj 2000; Tether 2005; Tödting et al. 2006). In general, these studies show that KIBS are more intensively engaged in innovation and training activities than their manufacturing counterparts, but that they are less likely to collaborate with international partners and to perform internal R&D. In addition, the innovativeness of KIBS is strongly associated with highly qualified employees and intensive collaboration with local customers and suppliers, compared to manufacturing firms.

In studying KIBS, researchers employed a wide variety of methods, in particular since analyses dealing with KIBS are not restricted to one single discipline. Scholars designed and used a wide variety of qualitative and quantitative data collection methods. Qualitative case study work has been concerned mostly with innovative processes. Researchers used both structured and unstructured interview guides to uncover information. Interviews were performed in order to characterize client relationships (Bettencourt et al. 2002) and knowledge transfer process (Larsen 2000; Lindsay et al. 2003). Interviews have also been used in a corroborative technique, along with questionnaires, to obtain a deeper understanding of the role of KIBS within the regional economies (Koch and Stahlecker 2006). Case study methods were also used to obtain data on new service development (Gallaher and Petrusa 2006; van der Aa and Elfring 2002), R&D services (Howells, 1995) or service project based development (Gann and Salter, 2000). Quantitative research has been more concerned with patterns (and varieties) of innovation types, forms and consequences. Descriptive statistics were employed to provide evidence of the nature of innovative activities in KIBS (Camacho and Rodriguez 2005; Evangelista 2000; Tether 2003; Tether and Hipp 2002; Vermeulen et al. 2005; Wong and Singh 2004). Cross-country comparisons related to innovation in KIBS were obtained in a similar manner (McCole and Ramsey 2004; Miozzo and Grimshaw 2005; Tether 2003). Multivariate data analyses were performed, comparing patterns of innovative processes in KIBS and manufacturing firms (Freel 2006; Muller and Zenker 2001; Sirilli and Evangelista 1998; Tödting et al. 2006; Wong and He 2005). Econometric models, using longitudinal firm-level data, explored the link between innovation and economic performance of KIBS (Cainelli et al. 2004; 2006).

When comparing the two groups of methods, their intellectual added-value differs. In the vast majority of the qualitative studies, the focus was prescriptive in nature, specifying how, and under which conditions, individual KIBS could become more innovative. In contrast, in the vast majority of the quantitative studies, the focus was on innovation patterns, in particular on the influence of specific determinants (such as R&D expenditures, skilled labor, competitive strategies, etc.) on KIBS innovativeness in general. Ear-

ly in the 1990s Wood et al. (1993: 698) alluded to the innovative influence KIBS may have on their clients: *"The business service sector now exerts a **significant independent and innovative influence** on how other businesses gain access to key expertise .... The growing scale and diversity of business services activities reflects a modern mode of operation in which small, high-expertise-based companies play a key role, whatever the efforts of large organizations to dominate some parts of the market"* [emphasis added]. Nevertheless, their focus was limited to the reinforcement or strengthening of KIBS clients' innovation capacities only. KIBS were not seen as potentially innovative in themselves. A similar view can be found in O'Farrell and Moffat (1995) for whom "strategic business services" generated intermediate impacts with the potential to enhance client firm added value and competitive advantage.

The innovative contribution of KIBS was also defined in reference to their clients. The inherent logic of the analysis is that the performance of a service corresponds intrinsically to the performance of an activity by an economic unit for the benefit of another in such a way as to **change** the condition of the latter. Consequently the "quantity" of services provided by KIBS to their clients is mostly measured by considering the **extent of changes** among the consumers of those services and not by observing the activity of the service producer (i.e. KIBS).

Nevertheless, gradually, the vision of KIBS in the literature has evolved from contributors to or facilitators of (manufacturing) innovative changes to co-producers of innovation. In particular, den Hertog (2000) – stressing the almost symbiotic relationship between KIBS and client firms – pointed to the significance of such non-technological factors in innovation as new service concepts, client interfaces and service delivery systems. In addition, he developed a generic model of service innovation that he applied to the case of KIBS. As a result of this analysis, den Hertog (2000) saw KIBS as (i) facilitators; (ii) carriers; and (iii) sources of innovation. Since then, scholars have considered KIBS as true innovators. For instance, Larsen (2001) found empirical evidence for Denmark showing: first that KIBS are more innovation oriented as compared to firms of all service sectors and then that there is a relation between high levels of KIBS internationalization and high levels of innovation activities. Similarly, and at the same time, Muller and Zenker (2001) investigated empirically the innovation activities of French and German KIBS and SMEs (small and medium-sized manufacturing firms). As a result they put forward the hypothesis of a virtuous innovation circle linking SMEs and KIBS, to be understood as: *"... a circle made virtuous through the knowledge generating, processing and diffusing function KIBS fulfill within innovation systems"* (Muller and Zenker 2001: 1514). In both analyses, the authors recognized explicitly that KIBS do not just contribute to the innovation capacities of their clients but that they are innovative by themselves.

Drawing on empirical evidence from a large scale survey, Tether and Hipp (2002) examined patterns of innovation and sources of competitiveness amongst German service firms, notably KIBS. According to their findings KIBS differ radically from other services when considering innovation issues: "*KIBS firms tended to spend significantly more on innovation (per employee) than did their less knowledge intensive counterparts, suggesting a considerably greater relative commitment to innovation amongst the knowledge intensive firms*" (Tether and Hipp 2002: 173). Moreover, distinguishing between what they call "*high knowledge intensity **technical** service firms*" and "*high knowledge intensity **other** service firms*", they observed that R&D appears to be particularly important for technical KIBS as compared to non-technical KIBS. Other characteristics of innovative investment could be stressed: KIBS tend to spend more on ICT than services in general (per employee), but invest **less** comparatively in new machinery and equipment. Such results are consistent with the fact that services are typically involved in changing the state of people, artifacts, or of information and knowledge, rather than (primarily) producing artifacts themselves (Miles 2005), and that the value of services is primarily to be judged by their effects on the user rather than how they are produced (Wood 2005). According to Wood (2005), service functions **sometimes led and sometimes followed** significant changes in other goods- and services-based functions, depending broadly on the comparative utility of their key expertise to their clients. "*Significant competitive change in a service-based economy never depends on a **single input**, but always on a **conjunction of expertise** in and between various phases of production: not just technological, but also creative, managerial, financial, human resource, logistical, marketing and regulatory expertise*" (Wood 2005: 431) [emphasize added].

Summarizing, a shift in the vision of KIBS by scholars with regards to innovation activities can be tracked. Initially, KIBS were seen as accompanying entities supporting their clients' innovation processes and adopting from time to time technologies developed elsewhere. Lately, they have been recognized as innovators and carriers of change on behalf of – and in cooperation with – their clients. Nevertheless, this is not the end of the story about KIBS and innovation. In fact, in our opinion a chapter is still to be written: it concerns the internal driving force of KIBS creativity.

### 2.3 What is lacking? Opening KIBS' innovation black box

As scholars started considering KIBS as a distinct research topic at the beginning of the 1990s, they most often used terms like "consultancy firms" or "business services" without addressing the "K" for knowledge of KIBS as such. A wording referring to "expertise" or "information-rich activities" was typically employed in order to characterize KIBS. Typically, Wood et al. (1993: 679), investigating the growth of business services

in the UK during the 1980s, wrote: "... *the distribution of such services, offering skills and techniques which clients have never developed in-house, has acquired its own dynamic, dependent on the location of other business services as much as other sectors. The 1980s saw an emerging need not just for "information-rich", but for "expertise-rich" environments ...*". This is a vision of KIBS as providers or transferors of specific information for their clients. The definition of KIBS given by O'Farrel and Moffat (1995: 112) illustrates perfectly the point: [KIBS are] "*those services which offer to clients **strategic information and expertise** which is **relatively intangible**, potentially durable in its effects and concurred with problem solving and policy making rather than routine administration*" [emphasis added].

Going one step further and attempting to adapt the model of organizational knowledge creation of Nonaka and Takeuchi (1995) to KIBS, den Hertog (2000) provided several insights into the interactions taking place between KIBS and their clients. His analysis emphasized the importance of tacit forms of knowledge flows that are at least as important as the codified forms of exchanges in the KIBS-client interactions. The process is described as an enrichment of the client's knowledge base by interference with the KIBS' knowledge base. This definitely means much more than just a transfer of information or the provision of an expertise since, according to den Hertog (2000: 511): "*KIBS can trigger and strengthen processes of knowledge conversion in clients ... They can provide new knowledge certainly, but they may also act as catalysts, which help internal communication and knowledge conversion.*"

This is consistent with the views expressed by Bettencourt et al. (2002), for whom the value-added activities of KIBS consist primarily of the accumulation, creation or dissemination of knowledge for the purpose of developing a customized service to satisfy clients' needs. For these authors, KIBS are confronted with the necessity to "educate" their clients and not just to "inform" them about the meaning and contents of the provided services. In the same line of reasoning, Wood (2002: 994) stresses that KIBS "... *often offer strategically significant technical or organizational knowledge that client staff do not possess, **or could not exploit without consultancy support***" [emphasis added].

The knowledge base – and not just the ability to transmit information or to provide expertise – increasingly occupies a central place in the literature devoted to the analysis KIBS. Larsen (2001) adopted what he calls a "distributed knowledge system view" presenting the knowledge bases of KIBS as intrinsically linked to the knowledge of their employees. This, in turn, constitutes a source of radical uncertainty for KIBS: "*The knowledge of the firm is also dispersed, i.e. it is situated in many different places in the firm and no single actor could possibly know of it all*" (Larsen 2001: 84).

Nevertheless, if we agree to the fact that no single individual within an innovative KIBS could possibly know everything about the global issue in both organizations, we consider that the individual level plays a crucial role (and has been so far totally neglected in the investigations related to KIBS and innovation).

Let us sum up the global argumentation we propose. When emphasizing that '*since KIBS' growth is much faster than that of other sectors, it cannot just be driven by the growth of these sectors that are users of KIBS'*', Miles (2005: 43) is strongly suggesting that something peculiar is happening within this type of firm which cannot just be explained by the changes affecting the context(s) in which they evolve. In line with this assumption, the starting point of the reflection proposed here consists of a basic observation: investigations of KIBS so far did not answer one question crucial for the understanding of their evolution. This question can be formulated very easily, using here voluntarily – and in a new context – Rosenberg's question (1982): What is happening inside the KIBS "black box"? In other words: 'Who is acting primarily in the added-value chain of KIBS?' Or 'Who is making the difference between an innovative (and maybe successful) KIBS and a less innovative (and/or successful) one?' Potentially important aspects of the functioning of these firms may have been neglected so far. For instance, the individual motivations and specific knowledge added-value of key actors inside KIBS have not been the object of targeted investigations. Expressed in a very concrete way, this may take the form of abilities such as "knowing how to network people and further resources", "recognizing opportunities (faster than competitors)", "developing visions about the future firm development", etc. These abilities appear at the same time to be very subjective and also closely linked to specific individuals who have *par excellence* the skill of knowledge-broker.

The issues of identification, diffusion and appropriation of knowledge are addressed in knowledge management literature. Knowledge intermediaries or brokers can in this context be characterized as individuals or organizations that mediate the supply and the demand for knowledge; more specifically, knowledge brokers link different knowledge sources or holders. They transfer knowledge and adapt it to different actors and contexts and can be characterized as '*third parties who connect, recombine, and transfer knowledge to companies in order to facilitate innovation*' (Cillo 2005: 404; see also Hargadon and Sutton 1997: 717). The knowledge brokerage role and function is strongly related to consulting firms: '*As defined in the literature, KBs [knowledge brokers] work closely with their business customers and provide specific innovation solutions and have usually acted as innovation and design consulting firms*' (Cillo 2005: 404).

While Hargadon and Sutton (1997) in their analyses on knowledge brokering strongly refer to third parties that link different (often distant) industries, which enables them to

get a huge variety of ideas that they validate and translate to new contexts<sup>2</sup>, Cillo (2005) transfers this concept to the firm-internal level, and analyzes brokers under the specific aspect of integrating market knowledge into innovating companies. In her conception, knowledge brokers do not simply transfer (market) knowledge within the target company, but they also manipulate it '*to facilitate the process of internal transfer between different groups or communities*' (Cillo 2005: 405). Behboudi and Hart (2006; 2008) specify the essential role of those intermediaries in stating that knowledge-related relationships and exchanges between different parties would be difficult, if not impossible, without the activities of knowledge brokers.

Referring to this strand of literature, the following specific characteristics of knowledge brokers can be depicted:

- They act as intermediaries between units or parties previously unrelated.
- This "in between" position enables them to diffuse existing knowledge in new contexts.
- Through these activities, they "bridge" different communities<sup>3</sup> within the firm. However, "bridging" does not only refer to the pure transfer of knowledge, but rather to a translation process, i.e. to the adaptation of knowledge in relation to the community to which it is transferred.

This highly creative process paves the way for "re-using" knowledge generated and/or applied in other contexts in order to find answers to new questions. From these findings it becomes apparent that linking different communities which would otherwise not collaborate represents a challenging task that requires understanding the respective goals and cultures of the different parties, further the capacity to formulate problems, to conceive solution strategies, to access the necessary resources and to translate them between the contexts (Dobbins et al. 2009). So, specific preconditions are necessary for successful knowledge intermediaries. First of all, this task requires a profound anchor-

---

<sup>2</sup> Hargadon and Sutton (1997: 717) thus relate the macro perspective of networks between clients and industries with 'micro perspectives on internal routines to describe the role of brokering in innovation.' They argue that successful brokers are integrated in organizations whose structures allow the acquisition, storage and retrieval of information in diverse combinations. According to their findings, the core value-generating activity of brokers lies in the initiation and realization of resource flows between formerly unconnected groups.

<sup>3</sup> We refer here to the concept of communities, for instance in the sense of Cohendet and Simon (2007), that they consider pertinent in shaping informal structures which – in interaction with the formal (hierarchical) firm structure – strongly drive the innovation process within a firm. Knowing communities are in this respect defined as 'autonomous learning groups of individuals' with common beliefs and interests. Unlike project teams, their interactions have a rather long-term character. Members are related by a high degree of trust; they frequently communicate, share resources and so generate and diffuse knowledge.

age of these persons in their companies in order for them to be acquainted with the different units, teams and communities, as well as tasks and projects, and also the social skills including communicative capabilities to realize the transfer of knowledge. This person should also have the capacity to bridge cognitive and/or cultural distances, an issue which is strongly related to recognition, acceptance and trust among the company's staff. Especially in a context of enhanced technological change, increasingly changing and volatile competitive environments, these characteristics are supposed to be of high prominence (see also Cillo 2005: 405/406 in this respect).

The core assumption of this paper deals with the existence of specific individuals within KIBS who perform tasks – based on their creative abilities – that significantly increase the creative capacities of the firms they are embedded in. We propose to call them "Knowledge Angel" because they fulfill a cognitive function that can be compared to the financial support of Business Angels: smart benevolent actors, who understand, believe and involve themselves in an opportunity before anybody else.

As already noticed, although many contributions to the economics of services have analyzed the characteristics of innovating KIBS and the consequences of these innovations, so far only superficial knowledge was gained about what is really happening *within* KIBS. In order to identify the possible individual motivations as well as the (expected) specific knowledge added-value of knowledge angels, in our studies, the choice was made to adopt an explorative methodology (detailed in the next section). This choice was mainly dictated by the novelty of the research field – for which no previous investigation could be found – and by the issues adopted, i.e. the assumptions to be tested. These assumptions can be briefly summarized as follows. Knowledge angels are (or may be) specific individuals, who:

1. typically act as consultants (but not necessarily exclusively);
2. may have the talent to "sense" (feel, detect) things before they happen, or make them "happen" (from the subjective point of view of an external observer);
3. make a difference in the way knowledge is created, organized and flowing within the firm and between the firm and its partners.

Now, how could knowledge angels be positioned in this context and how can they be differentiated from knowledge brokers? Knowledge angels, as we assume, clearly act as knowledge intermediaries, but in our vision, their role goes beyond knowledge brokerage. Our view is twofold in this respect: first of all, we clearly start from the internal perspective of a KIBS firm; however, we also include the "external world" from the point of view of the KIBS in question. Consequently, in our conceptual framework, we tend to integrate the internal and external broker conceptions by assuming that knowledge angels adopt both roles and functions. Further, we assume that knowledge

angels are visionary persons who – based on their creativity, their experience and their profound knowledge of markets, competitors, and challenges – have the ability to "sense" which knowledge could be useful and applicable in other contexts, and to develop visions about the future development of their company<sup>4</sup>.

This capacity would also correspond to the somewhat "unusual" nature of *angels*, acting "beyond the tangible spheres" of their KIBS. The external dimension in this respect refers to the KIBS' market environments and also to actors supporting the internal knowledge generation and adaptation process of the KIBS (e.g. consultants, network of sales and distribution partners, etc.). It can thus be assumed that knowledge angels adopt both a firm-internal and an external brokerage function. Internally, they are embedded in the formal organization of the KIBS. But especially in the case of smaller KIBS, we do not assume that these persons occupy a formal position in knowledge management, i.e. we suppose that they fulfill the role of knowledge intermediation, but (i) not exclusively and (ii) rather informally than formally. Externally, their position can be conceived as being centered between their company, market and clients, as well as (knowledge) suppliers, partners, etc.

In other words, knowledge angels are "suspected" of being able to generate their own markets (and/or to create their own jobs and working environments) to a certain extent. It is assumed that these key actors within KIBS have the talent and creativity to evaluate externally available knowledge and to match it with the KIBS' needs. This process requires existing knowledge to be scanned, absorbed and assessed and – most important – a decision to be made whether it may be valuable for the internal innovation activities of the KIBS.

These assumptions which guided the empirical analysis will be detailed in the next section.

---

<sup>4</sup> When discussing specific necessary characteristics of knowledge brokers, Dobbins et al. (2009) speak of 'interpreting the information in terms of the bigger picture.'

### 3 Some empirical observations

The following part of the paper deals with the methodology that was developed in order to track the existence of knowledge angels (section 3.1), with the results of the international investigations performed (section 3.2) and finally with a synthesis proposing to compare the respective characteristics of knowledge and business angels (section 3.3).

#### 3.1 An exploratory methodology

For the detection of knowledge angels within KIBS, it seemed unavoidable to develop an *ad hoc* methodology since never before something similar has been made, according to our knowledge of the literature devoted to KIBS and innovation.

The investigation aimed at identifying KIBS employees (or leaders) who (i) act as internal and external knowledge brokers, (ii) have the ability and visionary talent to develop strategies for themselves and their companies, and (iii) have a position in their company's structure allowing them to realize those ideas. For these purposes, the project named KAIROS (Knowledge Angels or the Reinvention of Outstanding Services) after the Greek god of "right time and timeless" was initiated in 2007. Since this investigation had a strongly exploratory character, the procedure adopted did not aim at a high level of exhaustiveness but mainly to maximize the probability to detect specific features revealing the existence and characteristics of knowledge angels, and to identify pertinent aspects for further research. The international character of the study seemed necessary in order to obtain indications concerning possible typical characteristics of KIBS and knowledge angels – typical to the respective national environments.

Altogether 45 personal in-depth interviews were conducted between October 2008 and the end of 2009 in five different countries with a focus on a particular region in each country in order to detect references to certain regional specificities, national environments and socio-cultural influences. As such 10 interviews were conducted in the French region of Alsace, 10 in Germany (in the western part of Baden-Württemberg), 10 in China (mainly in the Beijing agglomeration), 10 in Spain (in the Barcelona agglomeration), and 5 in Canada (mainly in the Montreal agglomeration).

An interview-guide was prepared for the interviews that allowed open responses and an interactive conversation in order to collect information along five rather heterogeneous dimensions (displayed comprehensively in Table 2) necessary for a better understanding of what is happening inside KIBS.

**Table 2: Main dimensions of the interviews**

<b>Dimension</b>	<b>Main aspects</b>
<b><i>ALPHA</i></b> <b>Professional and personal background</b>	Individual professional development Experiences from other sectors or fields of activities Experiences in the creation of a company
<b><i>BETA</i></b> <b>Business location and environment</b>	Relation between location and professional success Selection of current location: strategic or at random Relation of current location and creativity
<b><i>GAMMA</i></b> <b>Knowledge access and interaction</b>	Internal and external sources for solutions Attractiveness for "brilliant" co-workers Relations with academic world
<b><i>DELTA</i></b> <b>Problem-solving and visions</b>	Engineer vs. constructor/draftsman Anticipation and vision Personal factors in risk taking and problem-solving
<b><i>EPSILON</i></b> <b>Corporate frame, enterprise culture</b>	Specific culture and atmosphere Incentive and reward system Visions on future development of the company

Each of the dimensions consists of three major aspects covered during the course of the interview and are described in greater detail in the following sections.

The first dimension (*ALPHA*: professional and personal background) deals with the personal biography of the interviewees. Questions related to educational background and professional experience as well as possible experiences in the foundation of an own company were discussed under this topic (mutual influences between enterprise demography and the role of personalized key knowledge sources have been discussed in several contributions, for example by the OECD 2001). These types of topics are related to the above mentioned assumption that the key actors in firm-internal knowledge intermediation are supposed to be deeply embedded in their companies in order to succeed in bringing together ideas, knowledge and communities, and to be accepted and trusted by their co-workers. This is even more the case when looking at the external networking capacities of knowledge angels. So we assume, as a deduction, that most potential knowledge angels are senior rather than junior experts in their business and are working in positions within the internal hierarchy – however not necessarily leading management positions – that enables them to fulfill the above mentioned tasks.

The second dimension (*BETA*) deals with interlocutors' assessments of their location, i.e. their perception of their firms' environments for stimulating creativity and innovation within their company. The most crucial topic in this dimension is related to the factors explaining the choice of the current location of the considered firm as well as the

regional factors stimulating (or hindering) KIBS' internal innovation activities. These conceptual elements are rooted in reflections about the context in which KIBS are acting, based on discussions in economic geography that emphasize the interconnection between creativity and the environment in which creative processes take place<sup>5</sup>. More precisely, the issue investigated here is to determine to what extent knowledge angels rely on their location in specific territories for developing their creative activity.

A third set of questions (dimension GAMMA) addresses the types and forms of interactions within the firm and with external actors.<sup>6</sup> More specific issues dealt with the ways firms solve problems concerning for instance the design of their services or their market development and to whom they turn for solutions (within and outside the firm). Moreover, the question of gaining access to knowledge created elsewhere (i.e. other firms, other industries, other places within and outside the country, etc.) was raised. More specifically, it was asked to what extent it appears as a challenge to attract (and to retain) "brilliant" co-workers, and what are the main incentives in this respect. The inquiry looked also at identifying the factors that interviewees considered as stimulating or hindering their individual problem solving abilities.

Dimension DELTA concerns the specific modes of generating solutions and services, as well as personal characteristics with respect to problem-solving competence, stimulating and hindering factors, and "seeing and feeling" or "visionary" capacities of the interlocutors. This dimension is clearly determined by personality traits of the interlocutor and is at the core of the discussion about what knowledge angels may be.

A final set of questions (dimension EPSILON) attempts to characterize the firms in which the potential knowledge angels are working. The main focus is on the strengths and weaknesses of the firms, their degree of innovativeness (compared to their main competitors). Additional questions address the working atmosphere within the firm, the existence of a firm-specific (financial or non-financial) incentives or rewards system as well as possible future developments. These final aspects help to characterize the firm's context: the environment in which the interlocutors are acting and interacting, and possible specific firm-internal structures or hierarchies that might foster KIBS' knowledge-related activities and explain their innovative potential<sup>7</sup>.

---

<sup>5</sup> Cf. for instance Scott (1997; 2007); Florida (2002); Cohendet and Simon (2007) who highlight the importance of creative cities as fertile grounds for the firms located there).

<sup>6</sup> Cf. Hess (2004) or Granovetter (1990), who reflect issues of economic, territorial and social embeddedness of enterprises.

<sup>7</sup> Cf. Howells (1995) who proposed an integrated approach for case studies in innovation research (conceptualizing innovation as a form of creation by individuals within the firm).

This complex set of analytical dimensions raises the issue of what is finally the unit of analysis. As mentioned before we focus on selected KIBS and - within the enterprises - on selected individuals who are able to drive innovative potential and fulfill knowledge brokering roles. The unit of analysis (cf. Yin 2003: 22) stretches across both (i) the firm as an entity and (ii) single individuals who might reveal themselves as knowledge angels. Consequently, the selection procedure of the interviewees was two-fold: identification of firms and identification of key individuals within the firms.

In a last step, we tried to identify persons within the companies who could be potential knowledge angels. When possible, those key persons have been contacted directly, but in most cases, companies did not present their staff on the website and suggested an interview partner to us. The persons we were looking for are not necessarily the founders or owners of the concerned KIBS, and indeed, the relevant persons revealed to be at various levels of their organization. The selection process for our sample finally largely depended on the willingness of interviewed firms and key persons to engage in a discussion on the topic. Such a readiness is in itself at least an indicator of open-mindedness and curiosity.

### **3.2 Results from the international investigations**

As underlined previously, the investigation had a fully exploratory character and was not conceived as an exhaustive representative survey. Consequently, and as a clear limitation to the interpretation of the results, the analysis can only be qualitative, showing specific characteristics of individuals embedded in KIBS (taking into account their respective national environments). In other words, these results should not be (over)generalized without the support of additional data, but are rather thought to open the way for further investigations.

The results displayed here constitute a synthesis of the work performed by the KAIROS team over the past years. It is nevertheless the first time that all observations related to the five countries are considered at a glance.<sup>8</sup>

---

<sup>8</sup> Cf. the detailed results displayed in Muller, Zenker and Héraud (2009), Muller, Zenker and Baier (2012), Muller, Héraud and Zenker (2012).

Table 3: Synthesis of the 45 investigated cases

Case no.	Dimension					Most probable knowledge angels
	ALPHA Professional and personal background	BETA Business location and environment	GAMMA Knowledge access and interaction	DELTA Problem solving and visions	EPSILON Corporate frame, enterprise culture	
1	***	**	**	**	**	✓
2	**	*	**	**	**	
3	**	**	*	*	**	
4	***	**	**	**	**	
5	***	***	***	***	***	✓
6	***	***	***	***	***	✓
7	***	***	***	***	**	✓
8	***	**	**	**	**	✓
9	***	*	*	*	*	
10	**	**	**	**	**	
11	***	**	**	**	**	✓
12	***	*	*	*	**	
13	*	**	**	**	**	✓
14	**	*	*	**	**	
15	**	*	*	**	**	
16	***	**	**	**	**	
17	***	***	***	***	***	✓
18	***	**	**	*	**	
19	***	**	**	**	**	✓
20	**	*	**	**	**	✓
21	*	**	**	**	**	
22	***	***	***	***	***	✓
23	***	**	**	**	**	
24	***	***	**	**	**	✓
25	**	***	**	**	**	
26	**	**	**	**	**	
27	*	*	**	**	**	
28	***	***	***	***	**	✓
29	**	**	**	**	**	
30	**	*	*	**	*	
31	***	***	***	***	***	✓
32	***	***	***	***	**	✓
33	***	***	**	**	**	✓
34	***	**	**	**	**	✓
35	***	*	**	**	**	

Case no.	Dimension					Most probable knowledge angels
	ALPHA Professional and personal background	BETA Business location and environment	GAMMA Knowledge access and interaction	DELTA Problem solving and visions	EPSILON Corporate frame, enterprise culture	
36	**	**	***	***	***	✓
37	***	**	***	***	**	✓
38	***	***	***	**	*	
39	**	*	***	**	***	
40	**	**	**	***	*	
41	**	**	**	***	**	✓
42	***	**	***	***	**	✓
43	***	***	***	***	**	✓
44	***	**	**	***	*	
45	**	**	***	***	**	✓

*Note:* \*\*\* High probability of being a knowledge angel; \*\* Medium probability of being a knowledge angel; \* Low probability of being a knowledge angel. Germany: Cases 1-10, France: Cases 11-20, China: Cases 21-30, Spain: Cases 31-40, Canada: Cases 40-45)

From a conceptual perspective, knowledge angels show predominantly above-average results concerning the characteristics we wanted to measure. It becomes obvious that most of the persons classified as knowledge angel reveal outstanding achievements in their professional life. They are generally very active and engage in different fields and spheres of activity, for instance in business and science in parallel and/or as members of committees, as (co-)founder of one or several enterprise(s) and so forth. They are very ambitious and busy; their networks are large and allow them to get connected to diverse fields of information. They are open to a broad range of domains that they are able to connect to their central field of activity. In short: it appears that knowledge angels are curious and steadily looking for new opportunities. A joint characteristic of all knowledge angels is their high and above-average capacity to develop visions and to solve problems. Both characteristics make them key players in their companies' innovation activities. Not only these capacities as such, but their combination with corporate functions is at the core of what make them so central for the development of their company.

Persons classified as knowledge angels very frequently exhibit above-average abilities in accessing knowledge and in interacting. They clearly have soft skills and communicative abilities. Their companies developed various tools that are combined and applied in order to access new knowledge and to integrate it into the companies' innovative ac-

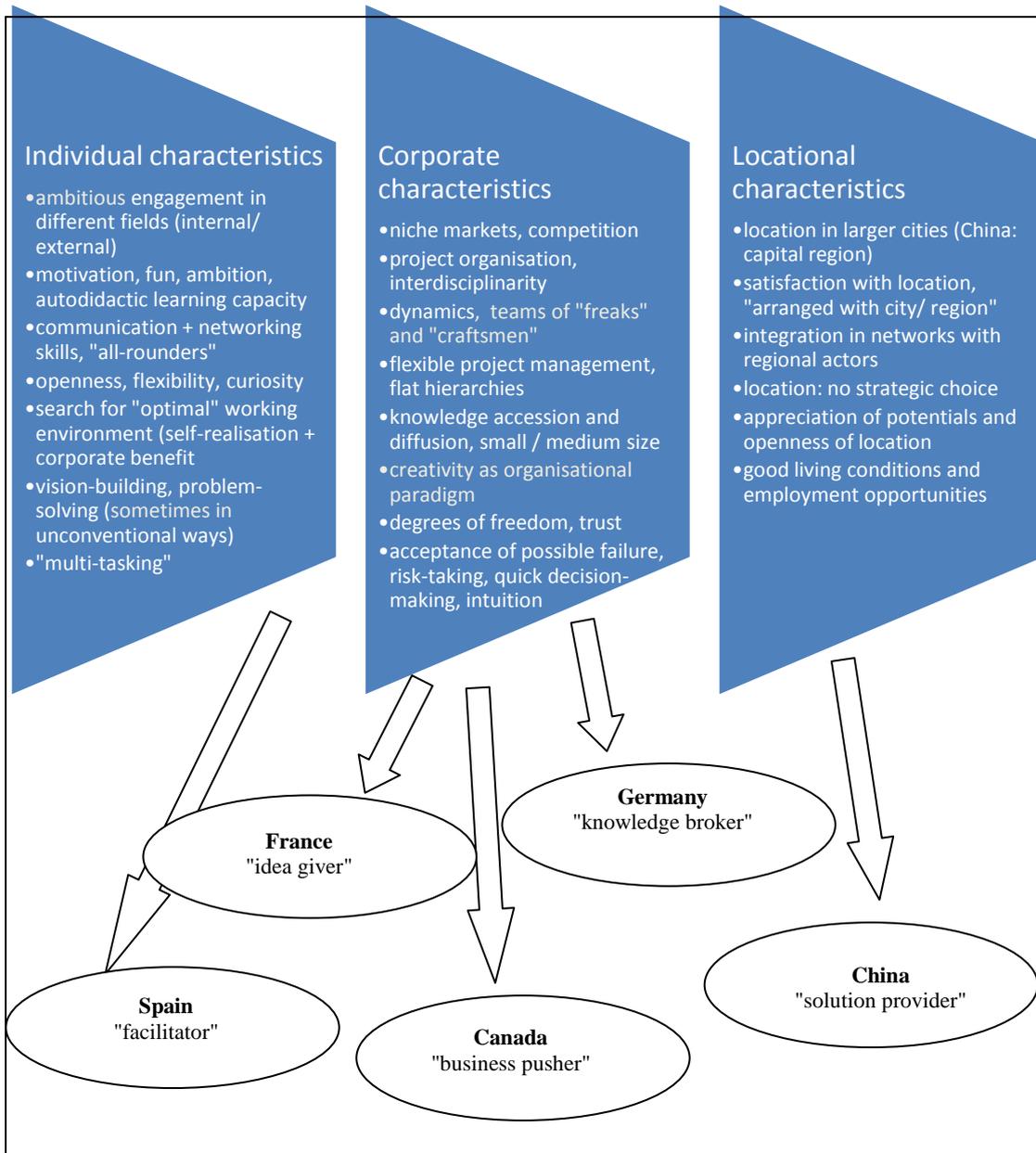
tivities. Generally, the acquisition of external competencies (i.e. through hiring new staff, engaging students and PhD students, integration in scientific networks or visiting conferences) is combined with the development of internal competencies through qualification measures or information searches for instance. In addition, various companies reported innovative tools to diffuse and to assemble contract-specific knowledge within their companies. The co-workers are considered as most crucial asset of the companies.

Very often, the persons classified as knowledge angels work in an environment that allows them to unfold their abilities and competencies. Generally, the companies' activities are organised in projects, realised by (interdisciplinary) teams. Knowledge angels are granted considerable degrees of freedom in their activities; this opportunity satisfies them in their professional position and motivates them to further engage for the benefit of their companies. Companies and their activities are considered as dynamic and flexible; one interlocutor mentioned the "dictate of change" in this context. Internally, creativity is strongly supported; creative ideas are considered as "steam" for the running "machine". A couple of knowledge angels considers him/herself as handyman, as an "all-rounder" that have the ability to bridge different enterprise functions and to play more than one role. However, the interviewed persons are well aware that a favourable working atmosphere is necessary and mention team spirit between co-workers, for instance through joint sports activities, modern office equipment, or financial incentives.

Contributing to innovative activities may in this respect be related to unconventional ways, to new forms of collaboration and partnership, new visionary models, etc. that can also fail. Crucial is the fact that the corporate environment leaves those persons the room and freedom to pursue such ideas and visions, thus grants them a high degree of trust and freedom. Summarising, trust, freedom, and the acceptance of possible failures are crucial in this respect, both on the individual and the corporate dimension: Individuals (knowledge angels) have the courage to introduce and implement (even apparently foolish) ideas – one interlocutor spoke of companies' "openness to rebel thoughts" – and the company leaders grant their staff a certain degree of freedom to engage in innovative (sometimes foolish) projects. The management not only supports visionary ideas, but it is open towards "freaks and visions" and trusts its co-workers, but also has a strong capacity to take risks and to quickly make decisions, often based on intuition (leading to trial-and-error-processes), but backed by discussions among a group of persons within the company.<sup>9</sup>

---

<sup>9</sup> Basically, this is the case in the European and North-American context; in China, decisions seem rather to be taken by the top management in any cases.

**Figure 1: Characteristics in terms of corporate and regional environments**

Source: Own presentation

Further, when being asked about the immediate spatial environment of the company, location motivations and networks and innovation-supporting factors in close proximity, knowledge angels are generally satisfied. They appreciate the potentials and openness of their companies' home locations and particular the good living conditions. Although the sites of the investigated companies do not belong to the national capitals (except in China where most interviews were performed in the capital region and where the location in Beijing is perceived as important asset in terms of professional success and

availability of talents),<sup>10</sup> interlocutors emphasise good and partly excellent conditions in terms of creativity, economic potentials, and especially concerning living conditions and opportunities to employ high-quality workers (who do not easily leave the company for better working conditions). They generally find their location attractive, both from a professional perspective and with respect to recreational values. In Alsace, the density of European institutions is mentioned and appreciated.

This last aspect leads to another important point referring to the position of knowledge angels in their service companies: They are not necessarily belonging to the management board of the company, are frequently holding a position between management and project level. They have of course insight into strategic processes, but – and this was frequently quoted among German interviewees – they are also engaged in project work. This is very important for them, independently from their precise position: they wish to keep in contact "with the base" and they like to stay engaged in project work. Besides the 'fun factor', this is an important indication for their visionary capacity: Knowledge angels can better unfold their abilities when being able to connect 'field work' with firm strategies and with the market environment. In other contexts, this double role in different types of activities maybe translated slightly differently: In Catalonia, for instance, it rather tends to be realised through professional engagement in different organisations or institutions.

It can thus be stated that knowledge angels actively search for a professional position that best possibly corresponds to their individual talents, abilities and visions. This could be observed in all our (European and North-American) case study regions. However, the way this goal is approached, may differ. While knowledge angels in Germany tend to search for a "good" position within their company, French and Canadian interlocutors seem to be to a higher extent engaged in own firm foundations (that they may also quit after a certain period). Most Spanish knowledge angels were clearly 'testing' several companies before finding or creating the appropriate one. In China, interviewees proved to be passionate about their function as top or middle level manager and are offering knowledge service whereas the quest for independence, self-realization and "business pushing" seems to characterize the interviewees from Montreal.

---

<sup>10</sup> The aspect of **Guanxi** should be mentioned in this context. Guanxi can roughly be translated by "business and/ or personal relationships", however reaching further than in the European meaning. It can be described as a form of trust which lays the base for the establishment of relationships and networks that are then crucial for professional activities. Guanxi is established through direct or indirect personal contacts (i.e. between persons that have been formally introduced to each other or know the same persons) and is a necessary precondition for interaction.

Similar in all regions is their motivation, self-realisation, curiosity, freedom in searching for a satisfying work that enables them to unfold their visionary, talents, their ideas and their creativity. Strongly related to their described position and working mode is their communicative competence. As indicated above, knowledge angels often anchor their professional activity in different 'poles', be it on the strategic and operative level of the same company or in interrelation of different working positions for different clients. This latter aspect means that our key persons divide their working time between different engagements. This ability of "multi-tasking" on different levels corresponds to knowledge angels' personality and enables them to connect different persons and different knowledge. Important to mention that knowledge angels in their search for the "best fitting position" are sampling diverse positions (within one company, in different ones or as a split between different engagements) until they find their "optimal" working environment.

### 3.3 A synthesis proposal comparing knowledge angels and business angels

In order to provide a synthesis of what knowledge angels are – or at least may be – it seemed us important to draw a comparison between them and business angels. In fact some analogies can be found between business and knowledge angels. The following table helps to distinguish how they respectively contribute to firms' evolution and innovation capacities (cf. Table 4).

**Table 4: A comparison of the core characteristics of business angels and knowledge angels**

Type of angel Characteristics	Business angels	Knowledge angels
Core resources	Money and business experience, contacts (and to a lesser extent ideas)	Knowledge, ideas and vision (and to a lesser extent business experience)
Strongest motivation for action	"Fun factor" and financial interest (and a willingness to support younger entrepreneurs)	Quest for freedom, self-realization, 'testing' new ideas (and a willingness to support co-workers)
Main forms of knowledge support	Supporting existing knowledge creation processes and situations	Initiating new knowledge creation processes and situations

Source: own compilation; business angel characteristics based on Just (2000), Hemer (2001)

Both types of angels bring pertinent assets to companies and can substantially contribute to those companies' success. However, though there are various similarities and mo-

tivations between both angel types, the main difference relies in the degree of integration in internal company issues: as active investors, business angels are external to the company they invest in, at least in the first phases of their investment. Even in further phases of collaboration they may be increasingly integrated in the company – for instance as board members – but still have a certain distance to day-to-day activities. On the contrary, knowledge angels in the conception presented here are completely 'internal' to the KIBS they are engaged in.

## **4 Main implications of the research**

In this final section we want to consider the implications of our empirical investigation for: further research on innovation in services and manufacturing (section 4.1); innovation management within service companies (section 4.2); and innovation and regional development policies (section 4.3).

### **4.1 Innovation studies**

Three main strands of further research can be considered in this field.

First aspect, our work was pioneering but remains very explorative. It is therefore necessary to broaden the sample of knowledge angels and to extend the methodology in order to ensure the validity of the results. Larger samples are required to characterize these service industries in the same countries and/or regions. Of course, studying new national contexts would bring interesting comparative materials. More in-depth analysis of these different geographical contexts must be done in order to ensure higher comparability of data. It would also be more rigorous to introduce control groups (i.e. KIBS without knowledge angels) for the evaluation of the impact of knowledge angels on the innovation capacities of KIBS. Finally, the production of time series could help to demonstrate some causal effects.

Second aspect, the comparison between different types of KIBS (e.g. P-KIBS and T-KIBS) would be interesting: Are knowledge angels more or less frequent following the type? What about the level of achievement reached by knowledge angels in these different environments?

Third aspect in this regard, in our work we make the assumption that knowledge angels are specific to KIBS organizations. Extending the scope of the search out of this perimeter (further types of service activities, manufacturing firms, large corporations, science and higher education institutions, public administrations...) would be a crucial test of the theory.

### **4.2 Innovation management within service companies**

The issue of innovation management seems to be a logical consequence of what was discussed before: How can knowledge angels be "detected" and supported? How can the generation of ideas and the succeeding process of generating innovations be "managed"? Is there a possibility to "plan" such creative processes?

At first sight, the vision of a detailed planning of the innovation process within companies looks at odd with the implicit conception of creativity we have: there should be no planning procedures for the development of visions, and concepts like freedom and trust as well as the anticipated and accepted eventuality of failure, look contradictory with anything like strategic management in a classical way. However, creativity and innovation management must not be considered as opposites and an "either – or" option, since innovation management has as much broader view, leading to the application and implementation of ideas and their transfer into new or improved products and processes.

Creativity and its support are consequently understood as integral part of a company's internal innovation management process and further complement the latter through referring to developments external to the company in question. Not to forget that the knowledge angel research performed so far and presented in the preceding section exclusively refers to knowledge-intensive business service firms (and not to manufacturing companies) with generally less formal innovation management structures. We thus plead for the integration of creativity-supporting processes into innovation management in order to let creative individuals to be identified and creative ideas be developed.

How can innovation management support the identification and promotion of knowledge angels and their activities within a KIBS? First of all, knowledge angels cannot be hired *per se* (as indicated by the explorative research presented above). They will rather be "detected" from the pool of collaborators of a firm. Furthermore, a high degree of "engagement" for the company is a priori an indicator of knowledge angels, but such engagement may be unconventional: it would be more convenient to speak of curiosity instead of engagement.

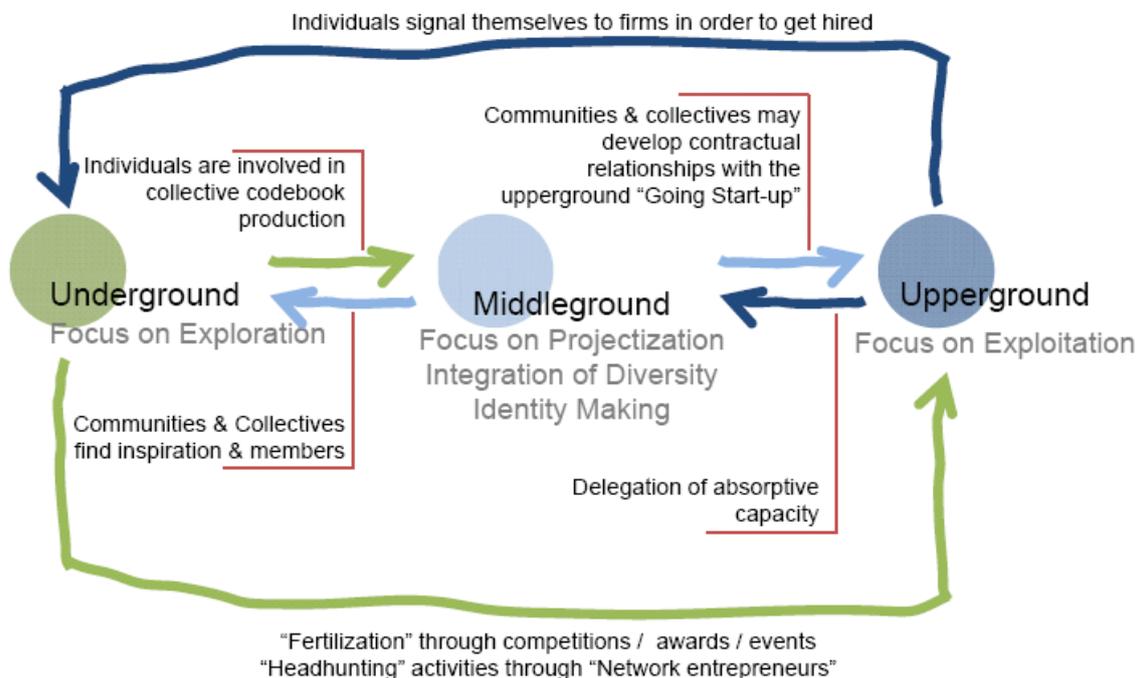
A further aspect highlighted in the preceding section refers to the knowledge angels' and their companies' relation to the respective environment, and the knowledge angel's involvement in internal as well as external networks, i.e. to (personal) relationships with other creative personalities. Most KIBS do not seem to have a large pool of knowledge angels, but rather one or a few persons who need to be integrated in further networks (internal and external to the company) in order to exchange information and to get access to further external knowledge. These networks may for instance consist of friends and colleagues, collaborators in research institutes, etc., in short: persons and personalities with which to share general thoughts and ideas. More precisely, we speak here of *communities*. We consider individual networks that are less business- and project-based, but rely on common thoughts and states of mind, eventually former joint experience (cf. Cohendet et al. 2010). These relationships may have an important function in the process of vision building.

### 4.3 Innovation and regional development policies

Research on knowledge angels may have implications on the reshaping of local innovation-oriented initiatives and regional development policies as indicated in previous papers (cf. Muller et al. 2012a).

The recent decades have witnessed an increasing prominence of the region as a relevant level for innovation policy. Theoretical discussions particularly underlined this issue in the nineties (cf. Amin and Thrift 1994; Cooke 1997; Malmberg and Maskell 1997; Morgan 1997; Storper 1997). It started being universally accepted that, within the general framework of increasing globalization, regions are key sites for knowledge creation and innovation. Therefore, instruments such as territory-based clusters linking private and public (in particular academic) actors developed worldwide around the turn of the millennium. They complement overall national instruments (sector-oriented policies, tax-credit systems, etc.) with more refined and focused devices. In a way, it was the discovering or re-discovering of the idea of the innovation "ecosystem".

**Figure 2: Anatomy of the creative city**



Source: adapted from Cohendet et al. (2010).

Such policies fully recognize the fundamental nature of innovation as an interactive multi-actor, multi-sector and multi-level learning process. Cohendet et al. (2010), while

presenting "the anatomy of the creative city" (cf. Figure 2), explain the complex process of creation linking three levels : The *underground* where relatively loose communities explore possible new concepts in various fields of knowledge or cultural spheres; the *upperground* formed of explicit organizations (firms and institutions), focusing on the exploitation of the new knowledge and therefore possibly performing the relevant innovations; and the *middleground* (composed of specific actors, platforms, events, places or spaces...) which is essential for catalyzing the transmission of novel opportunities between underground and upperground.

The research performed on knowledge angels pleads for integrating knowledge angels in schemes of local innovation policies. In a previous paper; we considered an analytical framework encompassing five basic dimensions that depict the characteristics of different types of innovation supporting policy instruments like cluster policies, ideas labs, identification and supporting of knowledge angels (cf. Muller et al. 2012a).

Having compared clusters, ideas labs and knowledge angels as possible "objects" of development initiatives (cf. Table ) we reached the conclusion that policy makers should integrate the support of knowledge angels as an instrument for local innovation-oriented policies in the future. Comparatively to cluster policies and to the development of ideas lab, supporting knowledge angels at local level may constitute a so-far not recognized but clearly promising option for their "toolbox".

**Table 5: A synoptic comparison of the three types of instruments**

<b>Instruments</b>	<b>Clusters policies</b>	<b>Ideas labs</b>	<b>Knowledge-angels supporting policies</b>
<b>Participation</b>	+++	+	++
<b>Interaction</b>	++	+++	++
<b>Equilibrium</b>	+	+++	++
<b>Resources</b>	+	++	+++
<b>Knowledge</b>	+	+++	+++

Source : Muller et al. (2012a, p. 83)

## 5 Conclusion

In this article we consider knowledge angels as a type of creative knowledge broker responsible for most of KIBS' efficiency in the global innovation process. In the economic and managerial literature, a lot of work has been devoted to the understanding of KIBS' influence on the innovative capabilities of the clients, and not so much on their own innovation process. Our aim was to show how specific high skilled individuals contribute to a reciprocal catalytic relationship between higher service providers and their clients. In this respect we tried to enter the KIBS' "black box". An *ad hoc* methodology was developed in order to perform the task of gaining new elements. We hope that the empirical observations made in five different national contexts (Canada, China, France, Germany and Spain) will show the way for further research dealing with innovation both in services and manufacturing industries, with innovation management (in particular within service companies) and more generally with innovation-led regional development policies.

### *Acknowledgement*

Many people supported us at the different stages of the research project. We wish particularly to thank our colleagues at the Fraunhofer Institute ISI (Karlsruhe): Elisabeth Baier, Thomas Stahlecker, Knut Koschatzky and Christine Schädel as well as Liu Li (Tsinghua University, Beijing), José-Carlos Ramos (Avanzalis, Barcelona), David Doloreux (University of Ottawa) and Réjean Landry (Université Laval, Québec).

The usual reminders apply

## References

- Alvesson, M. (1995): *Management of knowledge-intensive companies*. Berlin, New York: de Gruyter.
- Amin, A. and Thrift, N. (Eds.) (1994): *Globalization, Institutions and Regional Development in Europe*. Oxford: Oxford University Press.
- Balaz, V. (2003): Knowledge intensive business services in a transition economy. *Ekonomicky Casopis*, 51, 475-488.
- Barras, R. (1986): Towards a Theory of Innovation in Services. *Research Policy*, 15, 161-173.
- Barras, R. (1990): Interactive Innovation in Financial and Business Services: The Vanguard of the Service Revolution. *Research Policy*, 19, 215-237.
- Behboudi, M. and Hart, D. (2006): Knowledge Intermediaries: What Are They and What Do They Do?, Proceedings of 9th Australian Conference on Knowledge Management and Intelligent Decision Support (ACKMIDS). December 11-12, Melbourne, Australia.
- Behboudi, M. and Hart, D. (2008): Human Knowledge Intermediaries for Successful Knowledge Reuse and Sharing, Proceedings of the 5th International Conference on Intellectual Capital, Knowledge Management & Organizational Learning (ICICKM). October 9 & 10 2008, New York, USA, 53-60.
- Bettencourt, L.A., Ostrom, A.L., Brown, S.W. and Roundtree, R.I. (2002): Client Co-Production in Knowledge-Intensive Business Services. *California Management Review*, 44, 100-128.
- Cainelli, G., Evangelista, R. and Savona, M. (2004): The Impact of Innovation on Economic Performance in Services. *The Service Industries Journal*, 24, 116-130.
- Cainelli, G., Evangelista, R. and Savona, M. (2006): Innovation and economic performance in services: a firm-level analysis. *Journal of Economics*, 30, 435-458.
- Camacho, J.A. and Rodriguez, M. (2005): How Innovative are Services? An Empirical Analysis for Spain. *The Service Industries Journal*, 25, 253-271.
- Cillo, P. (2005): Fostering Market Knowledge Use in Innovation: The Role of Internal Brokers. *European Management Journal*, 23, 404-412.
- Cohendet, P., Grandadam, D. and Simon, L. (2010): The anatomy of the creative city. *Industry and Innovation*, 17, 91-111.

- Cohendet, P. and Simon, L. (2007): Innovation Knowledge-Intensive Firms and Creative Environments, CAS Workshop on "Innovation in Firms". Oslo, 30 October - 1 November.
- Cooke, P. (1997): Regions in a global market: the experiences of Wales and Baden-Württemberg. *Review of International Political Economy*, 4, 349-381.
- den Hertog, P. (2000): Knowledge-Intensive Business Services as Co-Producers of Innovation. *International Journal of Innovation Management*, 4, 491-528.
- Djellal, F. and Gallouj, F. (2001): Patterns of innovation organisation in service firms: postal survey results and theoretical models. *Science and Public Policy*, 28, 57-67.
- Dobbins, M., Robeson, P., Ciliska, D., Hanna, S., Cameron, R., O'Mara, L., DeCorby, K. and Mercer, S. (2009): A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implementation Science*, 4, 23.
- Evangelista, R. (2000): Sectoral patterns of technological change in services. *Economics of Innovation and New Technology*, 9, 183-221.
- Evangelista, R. and Savona, M. (2002): The Impact of Innovation on Employment in Services: evidence from Italy. *International Review of Applied Economics*, 16, 309-318.
- Evangelista, R. and Savona, M. (2003): Innovation, employment and skills in services. Firm and sectoral evidence. *Structural Change and Economic Dynamics*, 14, 449-474.
- Florida, R. (2002): The Economic Geography of Talent. *Annals of the Association of American Geographers*, 92, 743-755.
- Freel, M. (2006): Patterns of technological innovation in knowledge-intensive business services. *Industry and Innovation*, 13, 335-358.
- Gallaher, M.P. and Petrusa, J.E. (2006): Innovation in the U.S service sector. *Journal of Technology Transfer*, 31, 611-628.
- Gann, D M. and Salter, A.J. (2000) Innovation in project-based, service-enhanced firms: the construction of complex products and systems. *Research Policy*, 29, 7-8, 955-972.
- Granovetter, M. (1990): The Old and the New Economic Sociology: A History and Agenda. In: Friedland, R. and Robertson, A.F. (Eds.): *Beyond the Marketplace*. New York: Aldine de Gruyter, 89-112.
- Hargadon, A. and Sutton, R.I. (1997): Technology Brokering and Innovation in a Product Development Firm. *Administrative Science Quarterly*, 42, 716-749.

- Hauknes, J. (1999): *Knowledge intensive services – what is their role? Paper presented for the OECD Forum on Realising the Potential of the Service Economy, Paris, 28 September*. Paris: OECD.
- Hemer, J. (2001): Welcher Angel-Typ sind Sie? Eine Typologie deutscher Business Angels. *Finance*, October.
- Hess, M. (2004): 'Spatial' relationships? Towards a reconceptualization of embeddedness. *Progress in Human Geography*, 28, 165-186.
- Hollenstein, H. (2003): Innovation modes in the Swiss service sector: a cluster analysis based on firm-level data. *Research Policy*, 32, 845-863.
- Howells, J. (1995): A socio-cognitive approach to innovation. *Research Policy*, 24, 883-894.
- Just, C. (2000): *Business Angels und technologieorientierte Unternehmensgründungen*. Stuttgart: Fraunhofer IRB Verlag.
- Koch, A. and Stahlecker, T. (2006): Regional Innovation Systems and the Foundation of Knowledge Intensive Business Services. A Comparative Study in Bremen, Munich, and Stuttgart, Germany. *European Planning Studies*, 14, 123-145.
- Koschatzky, K. (1999): Innovation networks of industry and business-related services - Relations between innovation intensity of firms and regional inter-firm cooperation. *European Planning Studies*, 7, 737-757.
- Larsen, J.N. (2000): Supplier-user interaction in knowledge-intensive business services: types of expertise and modes of organization. In: Boden, M. and Miles, I. (Eds.): *Services and the knowledge-based economy*. London, New York: Continuum, 146-154.
- Larsen, J.N. (2001): Knowledge, Human Resources and Social Practice: the Knowledge-Intensive Business Service Firm as a Distributed Knowledge System. *The Service Industries Journal*, 21, 81-102.
- Leiponen, A. (2005): Organization of Knowledge and Innovation: The Case of Finnish Business Services. *Industry and Innovation*, 12, 185-203.
- Lindsay, V., Chadee, D., Mattsson, J., Johnston, R. and Millett, B. (2003): Relationships, the role of individuals and knowledge flows in the internationalisation of service firms. *International Journal of Service Industry Management*, 14, 7-35.
- Malmberg, A. and Maskell, P. (1997): Towards an explanation of regional specialization and industry agglomeration. *European Planning Studies*, 5, 25-41.

- McCole, P. and Ramsey, E. (2004): Internet-enabled technology in knowledge-intensive business services: A comparison of Northern Ireland, the Republic of Ireland and New Zealand. *Marketing Intelligence & Planning*, 22, 761-779.
- Miles, I., Kastrinos, N., Flanagan, K., Bilderbeek, R. and den Hertog, P. (1995): *Knowledge-intensive business services: users, carriers and sources of innovation* (= European Innovation Monitoring Systems. EIMS Publication No. 15). Luxembourg: DG XIII, Innovation Programme.
- Miles, I. (2005): Knowledge Intensive Business Services: Prospects and Policies. *Foresight*, 7, 39-63.
- Miozzo, M. and Grimshaw, D. (2005): Modularity and Innovation in knowledge-intensive business services: IT outsourcing in Germany and the UK. *Research Policy*, 34, 1419-1439.
- Morgan, K. (1997): The Learning Region: Institutions, Innovation and Regional Renewal. *Regional Studies*, 31, 491-503.
- Muller, E. (2001): *Innovation Interactions between Knowledge-Intensive Business Services and Small and Medium-Sized Enterprises: An Analysis in Terms of Evolution, Knowledge and Territories*. Heidelberg: Physica-Verlag.
- Muller, E. and Zenker, A. (2001): Business services as actors of knowledge transformation: the role of KIBS in regional and national innovation systems. *Research Policy*, 30, 1501-1516.
- Muller, E., Zenker, A. and Héraud, J.-A. (2009): *Entering the KIBS' black box: There must be an angel! (or is there some-thing like a knowledge angel?)* (= Working Papers Firms and Region). Karlsruhe: Fraunhofer ISI.
- Muller, E., Héraud, J.-A. and Zenker, A. (2012a): Innovation, territories and creativity: some reflections about usual and less usual instruments for innovation-driven regional policies. In: Burger-Helmchen, T. (Ed.): *The Economics of Creativity: Ideas, Firms and Markets*. Routledge: Oxon (forthcoming), 78-88.
- Muller, E., Zenker, A. and Baier, E. (2012b): Knowledge angels or how creative people foster innovation in the service industry: emerging concepts and international observations. In: Fraunhofer ISI (Ed.): *Innovation system revisited - Experiences from 40 years of Fraunhofer ISI research*. Stuttgart: Fraunhofer Verlag, 153-170.
- Nonaka, I. and Takeuchi, H. (1995): *The knowledge-creating company*. Oxford: Oxford University Press.
- O'Farrell, P.N. and Moffat, L.A.R. (1995): Business Services and their Impact upon Client Performance: An Exploratory Interregional Analysis. *Regional Studies*, 29.2, 111-124.

- OECD (2001): *Innovative People. Mobility of Skilled Personnel in National Innovation Systems*. Paris: OECD.
- Pawłowski, S.D. and Robey, D. (2004): Bridging users organizations: knowledge brokering and the work of information technology professionals. *MIS Quarterly*, 28, 645-672.
- Rosenberg, N. (1982): *Inside the Black Box: Technology and Economics*. Cambridge: Cambridge University Press.
- Scott, A.J. (1997): The Cultural Economy of Cities. *International Journal of Urban and Regional Research*, 21, 323-339.
- Scott, A.J. (2007): Capitalism and urbanization in a new key? The cognitive-cultural dimension. *Social Forces*, 1465-1482.
- Sirilli, G. and Evangelista, R. (1998): Technological innovation in services and manufacturing: results from Italian surveys. *Research Policy*, 27, 881-899.
- Smith, K. (2005): Measuring innovation. In: Fagerberg, J., Mowery, D.C. and Nelson, R.R. (Eds.): *The oxford handbook of innovation*. Oxford: Oxford University Press, 148-177.
- Soete, L. and Miozzo, M. (1990): *Trade and Development in Services: a Technological Perspective*. Maastricht: MERIT.
- Storper, M. (1997): *The Regional World. Territorial Development in a Global Economy*. New York, London: The Guilford Press.
- Strambach, S. (2001): Innovation processes and the role of knowledge-intensive business services (KIBS). In: Koschatzky, K., Kulicke, M. and Zenker, A. (Eds.): *Innovation networks. Concepts and challenges in the European perspective*. Heidelberg: Physica-Verlag, 53-68.
- Sundbo, J. and Gallouj, F. (2000): Innovation as a loosely coupled system in services. *International Journal of Services Technology and Management*, 1, 15-36.
- Tether, B.S. (2003): The Sources and Aims of Innovation in Services: Variety between and within Sectors. *Economics of Innovation and New Technology*, 12, 481-505.
- Tether, B.S. (2005): Do Services Innovate (Differently)? Insights from the European Innobarometer Survey. *Industry and Innovation*, 12, 153-184.
- Tether, B.S. and Hipp, C. (2002): Knowledge Intensive, Technical and Other Services: Patterns of Competitiveness and Innovation Compared. *Technology Analysis & Strategic Management*, 14, 163-182.

- Tödttling, F., Lehner, P. and Trippel, M. (2006): Innovation in knowledge intensive industries: The nature and geography of knowledge links. *European Planning Studies*, 14, 1035-1058.
- Toivonen, M. (2006): Future prospects of knowledge-intensive business services (KIBS) and implications to regional economies. *ICFAI Journal of Knowledge Management*, 4, 3.
- van der Aa, W. and Elfring, T. (2002): Realizing innovation in services. *Scandinavian Journal of Management*, 18, 155-171.
- Vermeulen, P.A.M., de Jong, J.P.J. and O'Shaughnessy, K.C. (2005): Identifying Key Determinants for New Product Introductions and Firm Performance in Small Service Firms. *The Service Industries Journal*, 25, 625-640.
- Wong, P.-K. and He, Z.-L. (2005): A Comparative Study of Innovation Behaviour in Singapore's KIBS and Manufacturing Firms. *The Service Industries Journal*, 25, 23-42.
- Wong, P.-K. and Singh, A. (2004): The Pattern of Innovation in the Knowledge-intensive Business Services Sector of Singapore. *Singapore Management Review*, 26, 21-44.
- Wood, P.A., Bryson, J. and Keeble, D. (1993): Regional patterns of small firm development in the business services: evidence from the United Kingdom. *Environment and Planning A*, 25, 677-700.
- Wood, P. (2002): Knowledge-intensive Services and urban Innovativeness. *Urban Studies*, 39, 993-1002.
- Wood, P. (2005): A Service-Informed Approach to Regional Innovation - or Adaptation? *The Service Industries Journal*, 25, 439-445.
- Yin, R.K. (2003): *Case Study Research: Design and Methods*. Thousand Oaks: Sage Publications.