CONNECTING THE DOTS: UNCOVERING THE TECHNOLOGY SCOUTING PROCESS

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I hereby declare that the work presented in this thesis is my own

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ABSTRACT

This dissertation analyses the challenges of internal and external knowledge sourcing processes in large multinational corporations. I identify the cognitive and behavioural mechanisms emerging in the initiation of a knowledge transfer— i.e. the initial stage of recognising opportunities for knowledge transfer and acting on these opportunities—and I examine how they impact actual patterns of intra- and inter-firm knowledge flows. The gist of this dissertation consists of two studies: an in-depth qualitative study and a quantitative study both set in the telecommunications service providers industry. The qualitative paper sheds new light on the *process* that specialised units in large multinational corporations (viz. technology scouting units) use to recognise and act on opportunities to transfer external knowledge. While the qualitative study uncovers the technology scouting process, the quantitative paper focuses on the outcomes of this process. More precisely, I examine how much certain knowledge properties that emerged from the qualitative study (e.g. knowledge "provenness" and knowledge dissonance) explain why do firms (fail to) act on opportunities to transfer external technologies. The data collection effort for those studies has extended over two years, involved more than 50 semi-structured interviews with managers in Silicon Valley, Europe and Asia and access to a proprietary database containing detailed information on 137 technologies assessed by the scouting units of a large European telecommunication services provider between January 2003 and December 2005.

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"Nobody said it was easy. No one ever said that it would be this hard"

The Scientist, Coldplay

I remember it well that in a vocational test in Rio de Janeiro, when I was only fifteen years old, I already said I wanted to be a PhD. At that time, I obviously had no clue about what pursuing a PhD entailed. I must confess that when I joined the PhD programme at London Business School six years ago, I still haven't had a good grasp of the challenges that were ahead of me. As the refrain of Coldplay's song above says, I knew it wouldn't be easy but I never thought it would be this hard. Looking back, I am now sure that the only reason why I managed to complete my PhD is because so many people have helped me all along the way. It is with tremendous gratitude that I acknowledge their support.

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Puranam. Freek has helped me to develop my ideas ever since I joined the PhD programme. Phanish was particularly helpful with the methods sections of all my papers. Both Freek and Phanish inspired me to become a rigorous organisation scholar, an inspiration that will accompany me for the rest of my academic career. I am also thankful to Don Sull whose help and advice was fundamental when I was starting my data collection effort. I owe a lot to two other faculty members of the department who, unfortunately, are no longer with us. I had the great privilege of working with Sumantra Ghoshal and Bjorn Lovas during my first two years in the PhD programme. This was an unforgettable intellectual and personal experience. Sumantra was a great scholar but above all a wonderful human being. Bjorn was a young and powerful thinker who was genuinely true to his ideas. I miss them both.

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I dedicate this thesis to my parents, to my wife and to my children.

London, May 27th, 2008.

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INTRODUCTION

There is increasing interest among scholars in the importance of knowledge sourcing—the process by which managers identify and gain access to relevant knowledge—particularly in multinational corporations (e.g. Bartlett and Ghoshal, 1989; Doz, Williamson and Santos, 2001; Eisenhardt and Santos, 2002; Gupta and Govindarajan, 2000; Hansen, 1999; Hansen and Lovas, 2004; Monteiro, Arvidsson and Birkinshaw, 2008; Szulanski, 1996, 2000, 2003; Zander and Kogut, 1995). Today there is a broad consensus that a multinational corporation (MNC) is "an international network that creates, accesses, integrates and applies knowledge in multiple locations" (Almeida, Song and Grant, 2002:148). Much research has also suggested that MNCs face rapidly changing environments and that they increasingly need to enrich their knowledge pool by adding distinctive new variations, which are necessary to provide a wide enough range of choices to solve new problems (March, 1991; Katila and Ahuja, 2002). In this context, the capacity to search for diverse knowledge is crucial (e.g. Hargadon and Sutton, 1997; Katila and Ahuja, 2002; Rodan and Galunic, 2004). And although new knowledge may reside within the MNC, accessing external sources of knowledge is increasingly important (e.g. Almeida, 1996; Fey and Birkinshaw, 2005; Rosenkopf and Nerkar, 2001; Rosenkopf and Almeida, 2003).

In an open innovation environment, as described by Chesbrough (2003a, 2003c, 2003e), MNCs need to constantly reach outside their own boundaries and view the world as a global canvas dotted with pockets of knowledge. And by sensing this dispersed knowledge — i.e. by identifying and accessing new competencies, innovative technologies, and lead market knowledge—MNCs are able to innovate more effectively than their rivals (Doz et al., 2001:5). In fact, the existing literature provides empirical evidence not only that external knowledge sourcing has increased considerably in the last

ten or fifteen years (e.g. Arora, Fosfuri and Gambardella, 2004; Fosfuri, 2006; Hagedoorn, 2002; Miotti and Sachwald, 2003) but also that some MNCs do manage to effectively source external knowledge across geographic boundaries (e.g. Almeida, 1996; Almeida and Kogut, 1999; Narula and Duysters, 2004; Narula and Hagedoorn, 1999; Rosenkopf and Almeida, 2003). It has also been shown empirically that firms that engage in external knowledge sourcing have a number of innovation benefits (e.g. Eisenhardt and Santos, 2002; Henderson and Cockburn, 1994; Laursen and Salter, 2006; Rosenkopf and Nerkar, 2001).

A striking feature of this stream of literature is that although it helps us understand the motivations behind the search for external knowledge (i.e. why firms do it), it fails to shed light on the actual *process* through which MNCs search for opportunities to transfer external technologies, i.e., *how* they do it.

This is to say that we know very little about the initiation of the external knowledge sourcing process—the initial stage where firms search, recognise and eventually act (or fail to) on opportunities to transfer external knowledge— and the possible reasons for knowledge stickiness at this stage of the process (Szulanski, 1996; 2000; 2003). I suggest this is in large part due to the fact that most of the extant research on external knowledge sourcing has either relied on patent data to describe the search process (e.g. Almeida, 1996; Almeida and Kogut, 1999; Katila and Ahuja, 2002; Rosenkopf and Almeida, 2003) or focused on steps subsequent to the identification of external knowledge i.e. the form of relationship that can be potentially established to exploit such knowledge—e.g. acquisition, licensing, contracting, partnering, etc.— once an opportunity to transfer external knowledge has been identified and recognised as such (e.g. Fey and Birkinshaw, 2005; Graebner, 2004; Vanhaverbeke, Duysters and Noordhaven, 2002).

Therefore, most existing research has taken into account only those opportunities to transfer external knowledge that have been followed-up by the in-sourcing firm. In other words, we know only about those opportunities to transfer knowledge that have been acted upon by the MNC (e.g. external patents that have been cited, research and development agreements that have been established, corporate venture investments that have been made).

Previous research, however, has also suggested that searching for, recognising and acting on opportunities to transfer external knowledge dispersed around the world is not a trivial task. First, there is an important body of research pointing to the geographic localisation of knowledge (e.g. Almeida, 1996; Almeida and Kogut, 1999; Jaffe, Trajtenberg and Henderson, 1993). It has been shown, for example, that if a MNC wishes to access the knowledge developed in Silicon Valley it should have a physical presence there (e.g. Almeida and Kogut, 1999). Then, we have the problem traditionally described in the multinational management literature (e.g. Birkinshaw and Arvidsson, 2004; Doz et al., 2001; Forsgren, Holm and Johanson, 2005) that if a MNC establishes a unit in a knowledge hotbed, it is very hard for that unit to be embedded both in the internal (with other units within the firm) and external networks (with the local community). Moreover there are also the known difficulties in transferring knowledge within the firm (e.g. Ambos and Ambos, forthcoming; Hansen, 1999; Hansen and Lovas, 2004; Gupta and Govindarajan, 2000; Monteiro et al., 2008; Schulz, 2001, 2003; Szulanski, 1996, 2000, 2003).

We also know, from the attention-based view of the firm (e.g. Bouquet and Birkinshaw, forthcoming; Ocasio, 1997), that decision makers at the MNC's headquarters are selective in the issues and answers they attend to at any time and that what they do depends on what issues and answers they focus their attention on (Ocasio, 1997:190). As

a consequence, many opportunities to transfer external knowledge identified by the MNC's subsidiaries around the world are bound not to receive any attention.

In sum, despite the importance of the initial stage in the external knowledge sourcing process—overcoming the initiation stickiness is a necessary although not sufficient condition for the success of the external knowledge sourcing process as a whole—and its complexity, there is very little fine-grained research about it.

This dissertation addresses this gap in the literature. I present below a multi-methods research design that combines both a qualitative and a quantitative study. The first (qualitative) study examines in detail what is the process through which MNCs scout the globe looking for opportunities to transfer external technologies. And by shedding light on this process, this study also provides some novel insights into the behavioural and cognitive patterns that may explain why some identified opportunities to transfer external knowledge receive attention and are acted upon while others are neglected and receive no action. In short, it focuses on the *how* and *why*. The second study goes one step further and tests the relative impact of specific factors that emerged from the qualitative study on the likelihood of opportunities to transfer external technologies being acted upon (i.e. the *how much*). While the qualitative study focuses on the technology scouting *process*, the quantitative paper focuses on its *outcomes*.

Organisation of the Dissertation: Chapter 1 describes a literature review that examines prior-art regarding external technology sourcing; its strategic importance and its relevance to MNCs. This review reveals a gap in the literature: we do not have a fine-grained understanding of how the external technology sourcing process is initiated and why some opportunities to transfer external technologies are acted upon or not.

Chapter 2 describes the empirical setting of this dissertation. Chapter 3 describes the methodology of the qualitative study which involved more than 50 semi-structured interviews over the period of 34 months with managers in three continents; numerous field observations and the access to a proprietary database containing detailed information on 137 external technologies that were scouted by one of the largest telecommunication services providers in the world, between January 2003 and December 2005.

Chapter 4 describes the findings from this study, which indicate that technology scouting goes much beyond external search, involving significant efforts in internal search, translation and matching. As much as scouters spend time searching for external solutions, they also have to identify internal requirements; translate external knowledge to the company's language; match the external solution to specific needs within the firm and "sell" that internal solution internally. My findings also indicate that opportunities to transfer external technologies may receive attention because they come with the market provenness that technologies developed internally do not have. Finally, I identified a new knowledge dimension—which I labelled knowledge dissonance—and suggested that opportunities to transfer dissonant external technologies are less likely to be acted upon.

Chapter 5 provides the motivation and the hypotheses that drive the quantitative study. The quantitative study is designed to understand the relative impact of certain knowledge attributes that emerged from the qualitative study (market provenness and knowledge dissonance) and of process-related factors (effort spent in search, internal selling and matching) on the likelihood of an opportunity to transfer an external technology being acted upon.

Chapter 6 describes the quantitative methodology used. Proprietary and public sources combined with a survey provide the data about 137 external technologies scouted in a three-year period, which form the empirical core of this study.

Chapter 7 presents the findings from this study, which suggest that while knowledge dissonance decreases the likelihood of a successful initiation, market provenness has the opposite effect. It also shows, though, that there is no moderating effect between those two variables. Finally, it indicates that the efforts scouters devote to internal activities (e.g. search, selling and matching) have a positive and significant impact on the likelihood of a successful initiation while the efforts they make outside the firm searching for the opportunities to transfer external technologies do not seem to have a significant impact on the success of the initiation stage.

Chapter 8 sets out the cumulative conclusions from these two studies, the limitations and contributions of this dissertation and suggests some avenues for future research.

CHAPTER 1. LITERATURE REVIEW AND RESEARCH GAP

1.1. INTRODUCTION AND DEFINITIONS

Knowledge sourcing has been extensively studied in the extant literature and has been broadly defined as the "knowledge process by which managers identify and gain access to relevant knowledge that is being created in the environment" (Eisenhardt & Santos, 2002:145). Knowledge sourcing can take place both within and outside the firm. Intra-firm knowledge sourcing occurs when relevant knowledge is identified and shared among organisational sub-units (e.g. knowledge sourcing among units of a multinational company; Gupta and Govindarajan, 2000; Hansen, 1999, Monteiro et al., 2008; Szulanski, 1996, 2000, 2003).

External knowledge sourcing, on the other hand, occurs when the relevant knowledge being accessed resides outside the firm. A specific type of knowledge—technology—has been the focus of most of the literature on external knowledge sourcing and will be the primary object of this study as well. Technology comes in very different forms, and it is very difficult to define it in such a way that would satisfactorily encompass all interesting cases of external technology sourcing (Arora, Fosfuri & Gambardella, 2004). There are very broad approaches like Dosi's (1982:151) definition of technology as "a set of pieces of knowledge, both directly 'practical' (related to concrete problems and devices) and 'theoretical' (but practically applicable although not necessarily already applied), know-how, methods, procedures, experience of success and failures and also, of course, physical devices and equipment".

Still broad but more succinct than Dosi's (1982), here I build on Burgelman, Christensen and Wheelwright (2004:2) to define technology or technological knowledge as "the theoretical and practical knowledge, skills, and artifacts that can be used to

develop products and services as well as their production and delivery systems". Hereinafter, I use knowledge, technology and technological knowledge interchangeably.

Different approaches and terms have been used in the literature to describe the large variety of collaborative relationships and contractual arrangements that firms establish with other organisations to access and acquire external technology. For instance, Fey and Birkinshaw (2005) call it "external sources of knowledge in R&D organisations"; Narula and Hagedoorn (1999) refer to "strategic technology partnering"; Chiesa and Manzini (1998) "technology collaboration"; Chiesa, Manzini and Pizzurno (2004) "external R&D"; Quinn (2000) "innovation outsourcing"; just to mention a few terms found in the literature. Here, I adopt the nomenclature suggested by Chatterji (1996) and Vanhaverbeke et al. (2002), among others: "external technology sourcing". External technology sourcing can be defined "as the process of finding, evaluating, acquiring and internalising useful technical knowledge from external sources to complement or extend internal efforts or to diversify the current business and technology base" (Chatterji, 1996:48).

The definition above is particularly appropriate here because it reveals the multi-staged nature of the external technology sourcing process. In this regard, I should highlight again that the very initial stage where firms are searching for opportunities to transfer external technologies—which I will later redefine as scout—is the specific stage, which is the main focus of my research.

However, in order to set the context, before I review the literature on how organisations search for opportunities to transfer external knowledge, I will examine the technology and innovation management literature that provides empirical evidence about the relevance of this phenomenon, showing that firms are increasingly sourcing technology externally and explaining the reasons motivating that trend. Then, I will

briefly review the literature on knowledge management and the knowledge-based view of the firm that shows the strategic relevance of this process, revealing the association of external knowledge sourcing with different measures of innovation, and ultimately with firm performance. After showing the increasing prevalence of the phenomenon as well as its impact on firm innovation performance, I will examine the multinational management literature perspective on sourcing external technologies across geographic boundaries. Finally, I will review the extant literature on the knowledge transfer process and will suggest that more scholarly attention needs to be devoted to the initial stage of this process, i.e., on how MNCs search for (and eventually act on) opportunities to transfer external technologies.

1.2. EXTERNAL TECHNOLOGY SOURCING

1.2.1. Background

External technology sourcing is not new. Lamoreaux and Sokoloff (1998), for instance, showed that there was an active market for patents, and possibly an active market for technology as well, before Research and Development (R&D) was institutionalised in large corporations last century. Although markets for technology have existed for a long time, with the advent of the corporate R&D laboratories, firms began to develop their own technologies and interest in external technology sourcing diminished considerably. Drawing on the idea of imperfections in technology markets, Nelson (1959) provided the first rationalisation for why and under what conditions firms would invest in R&D, an idea elegantly generalized by Arrow (1962). In a related vein, Williamson (1975) and Teece and Armour (1977), for example, used transaction-cost economics theory to argue that R&D is more efficiently governed by hierarchies than by markets.

Starting in the early 1980s, various empirical studies have documented significant interfirm, interindustry, and intertemporal differences in the degree to which firms obtain R&D services from in-house versus external sources (e.g. Bozeman & Link, 1983; Pavitt, 1986; Pisano, 1990; von Hippel, 1982).

Although academic research on the access and acquisition of external technologies precedes the literature on the knowledge-based view of the firm (KBV started to be articulated by the mid-1990s with, for example, Conner and Prahalad, 1996; Grant, 1996a; Kogut and Zander, 1996;), it was only in the 1990s, almost in parallel to the KBV studies on external knowledge sourcing, that a number of studies on technology and innovation management provided substantial evidence that firms were increasingly relying on external knowledge to develop their technological capabilities (e.g. Hagedoorn, 1996; Narula and Hagedoorn, 1999; Veugelers, 1997).

As Veugelers (1997:303) put it, in view of the increasing complexity and multidisciplinarity of research, even the largest and most self-contained organisations needed to access some external technology. The fact is that over the past ten to fifteen years, there has been a rapid growth in a variety of arrangements for the exchange of technologies or technological services, ranging from R&D joint ventures and partnerships, to licensing and cross-licensing agreements, to contracted R&D (e.g. Arora et al., 2004:2; Fosfuri, 2006). For instance, there is empirical evidence that the number of R&D partnerships—which include joint ventures and other inter-firm agreements that contain some arrangement for transferring technology or joint research (Hagedoorn, 2002:491)—has increased considerably in the 1980s and 1990s. Miotti and Sachwald (2003), for example, report that in the MERIT-CATI database the proportion of R&D partnerships in pharmaceuticals and information technologies has increased from 40% to 80% of the total between 1980 and 1998. In a similar vein, Gridley and Teece (1997) reported an

increasing use of technology licensing by companies such as Hewlett-Packard, Texas Instruments, IBM and AT&T during the 1990s. Mowery (1988) used industry case studies to suggest that there has been an increase in the number of collaborative ventures among firms, notably of those involving technology and R&D. Fosfuri (2006:1141) reported that in 2005 licensing revenues were estimated to account for US$ 45 billion per year in the United States alone; while the global figure was approximately US$ 100 billion annually.

According to Hagedoorn (2002:480) the major factors for this increase in external technology sourcing are related to important industrial and technological changes in this period that have led to increased complexity of scientific and technological development, higher uncertainty surrounding R&D, increasing costs of R&D projects and shortened innovation cycles that favour collaborations (e.g. Contractor and Lorange, 1988; Dussauge and Garette, 1999; Hagedoorn, 1993, 1996; Mowery, 1988; Mytelka, 1991; Nooteboom, 1999; OECD, 1992). But this rising interest in external sources of technology should not be attributed only to demand factors. Chatterji (1996:48), for instance, enumerated three factors from the supply side that were drivers for the increasing availability of technology from external sources: 1. scientific and engineering knowledge was growing at a rapid rate all over the world in most major disciplines; 2. there was an increasing availability of venture capital and the formation of numerous start-up companies and 3. a significant pool of displaced talent emerged from re-engineering and downsizing processes in large firms.

In a related vein, a number of managerial articles in the early 2000s suggested that companies should increasingly import new ideas and expertise through different forms of R&D collaborations (e.g. Linder, Jarvenpaa & Davenport, 2003; Quinn, 2000; Rigby and Zook, 2002). Chesbrough (2003a) went even further to introduce “Open Innovation” as a

paradigm shift in how companies innovate and commercialise industrial knowledge. Contrary to the exemplary model of innovation (which Chesbrough calls "closed innovation") developed by large multinationals in the 20th century—characterized by a fully integrated pipeline of innovations, from basic scientific research to development to the release and sale of new products—in the open innovation paradigm, "valuable ideas can come from inside or outside the company as well. [Open Innovation] places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths to market during the Closed Innovation era" (Chesbrough, 2003a:43).

Consistent with the drivers enumerated elsewhere in the literature (e.g. Chatterji, 1996; Hagedoorn, 2002), Chesbrough (2003a) also suggested four erosion factors that undermined the logic of closed innovation, namely: 1. the growing mobility of highly experienced and skilled people; 2. the burgeoning amount of college and post-college training that many people obtained; 3. the growing presence of private venture capital (VC), which specialised in creating new firms that commercialised external research and converting these firms into growing, valuable companies and; 4. the increasingly fast time to market for many products and services, making the shelf life of a particular technology ever shorter.

John Seely Brown, Director Emeritus of Xerox Palo Alto Research Center, wisely summarised these points when he explained why it is important to innovate innovation. According to Brown, in the preface to Chesbrough's book (2003a), most prior innovation models turned on the creativity within the firm; while in today's world firms are faced with two new realities: first, there are now powerful ways to reach beyond the conventional boundaries of the firm and tap the ideas of customers and users. Second, today most of the world's really smart people are not members of any single team but are

distributed all over the place in multiple institutions. Similarly, firms are now looking for innovations in the interstices between different disciplines—for example between bio- and nanotechnologies or telecommunications and information technology.

Chesbrough (2003a) draws on case studies of large firms such as IBM, Intel, Lucent, Procter & Gamble and Xerox to describe some processes and mechanisms through which internal innovation can be commercialised outside the organisation and external sources of innovation can enter into an organisation. Particularly relevant to this study, Chesbrough (2003a:53) suggests that firms should reorganise their R&D areas so that in addition to generating internal knowledge, they are able to "identify, understand, select from, and connect to the wealth of available external knowledge".

Chesbrough's work (2003a, 2003b, 2003c; 2003d, 2003e, 2006) had a significant impact among practitioners and also caught the attention of the academic community. These articles and books, however, were written with a managerial audience in mind. A first effort to provide an academic and therefore more systematic and rigorous analysis of the issues involved in the transition from a closed innovation to an open innovation paradigm (and a more profound discussion about whether this transition is really happening at all) was provided in Chesbrough, Vanhaverbeke and West (2006) and few would disagree that open innovation is a topic that has increasingly been receiving scholarly attention[1].

[1] In the last few years, a number of symposia and professional development workshops on open innovation have been organised at the Academy of Management conference. In addition, some academic journals (e.g. R&D Management and International Journal of Technology Management) have published/will publish special issues dedicated to research on open innovation. A good source for the recent developments in this research stream is the website http://www.openinnovation.net/Research/index.html, maintained by Professor Joel West from San Jose State University.

1.2.2. Strategic Relevance

The aim of the section above was to demonstrate the increasing prevalence of external technology sourcing. In this section I review the strategic management literature showing that external technology sourcing is consequential to innovation and ultimately to firm performance.

The idea that accessing external knowledge is fundamental to innovation can be traced back to the seminal work by March (1991) on the distinction between exploration and exploitation. According to March (1991:71) exploitation includes such things as refinement, choice, production, efficiency, selection, implementation and execution. Exploration, on the other hand, includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation (March, 1991:171).

Exploitation has some advantages as it restricts the breadth and, as a consequence, the cost of the search process, but also results in the acquisition of knowledge that can be more easily recognized and managed by the organisation's existing routines and members (Cohen and Levinthal, 1990; Rosenkopf and Almeida, 2003:753). In addition, exploitation enables firms to focus on similar technologies, creating incremental innovations and becoming more expert in their existing domains. Rosenkopf and Nerkar (2001:288) call this "first-order competence", which in a first moment can be a distinctive competence and generate a competitive advantage but the risk is that it may lead firms to develop "core rigidities" (Leonard-Barton, 1995) or to fall into "competency traps" (Levitt and March, 1988).

Considering, however, the increasing dynamism of the environment, with its frequent and rapid changes in technology, customer preferences and competition, some firms do attempt to move beyond exploitation to successfully compete over time (e.g.

McGrath, 2001; Rosenkopf and Almeida, 2003; Rosenkopf and Nerkar, 2001). In that regard, there is empirical evidence suggesting the importance of sourcing knowledge across organisational boundaries and geographic regions (e.g. Song et al., 2001).

According to Katila and Ahuja (2002:185), the logic behind the importance of increasing search scope is twofold: first, search with high scope can enrich the knowledge pool by adding distinctive new variations, which are necessary to provide a wide enough range of choices to solve problems (March, 1991). Second, search scope can increase a firm's innovation through enhancing combinatory search (e.g. Fleming & Sorenson, 2001; Nelson and Winter, 1982), as an increase in scope adds new elements to a firm's knowledge base, improving the possibility for finding a new useful combination (Katila and Ahuja, 2002:185).

Many strategy scholars would share the view that external knowledge sourcing is a critical process as it broadens a firm's knowledge base and foster the development of new knowledge through combination of existing forms of knowledge (Kogut and Zander, 1992; Vermeulen and Barkema, 2001). From an innovation perspective, external knowledge provides the organisation with the potential for novel action, and the process of constructing novel actions often entails finding new uses or new combinations of previously disparate ideas (Hargadon and Fanelli, 2002:292).

In fact, there is significant empirical evidence linking external knowledge sourcing to different measures of innovation performance. Henderson and Cockburn (1994), in a pharmaceutical industry study, found that the allocation of key resources through collaborative processes and the existence of pro-publication incentives that promoted links to the wider external scientific community were strongly correlated with research productivity. Powell, Koput and Smith-Doerr (1996) used an external knowledge sourcing argument to explain the patterns of alliances in biotechnology firms. Using a

longitudinal social network analysis with five years of data, Powell et al. (1996) found that R&D collaborations become admission tickets to an external knowledge network, and vehicles for the rapid communication of new knowledge. They concluded that biotech firms that do not engage in interorganisational collaboration agreements have a "liability of unconnectedness" and tend to have lower performance than those firms that have larger, more diverse alliance networks.

In a related vein, but focusing on informal external linkages, Liebeskind et al. (1996) analysed the publication and patent records of two highly successful biotechnology firms and observed a broad range of research collaborations with external parties, which were not covered by either contractual or market arrangements. Their argument was that in a complex and rapidly changing environment, those informal boundary spanning networks represent opportunities for sourcing scientific knowledge from external experts, which enabled those biotech firms to learn and be more flexible than they would otherwise be in a self-contained hierarchical organisation.

Bierly and Chakrabarti (1996) used a longitudinal analysis of 21 pharmaceutical companies over a 15-year period to develop a taxonomy of knowledge sourcing strategies based on four key strategic decisions about knowledge development: 1. balance between internal and external sources of knowledge; 2. preference for radical or incremental learning; 3. learning speed and; 4. breadth of knowledge base. Using cluster analysis techniques they identified four generic knowledge strategy groups: "explorers"; "exploiters"; "loners" and "innovators". The authors found that firms in the innovator (aggressive knowledge developers, high levels of internal and external knowledge acquisition, focused both on radical and incremental innovation and with a high learning speed) and explorer (preference for very radical learning and average value on the dimensions) groups tended to be more profitable than firms in the loners (slow and

inward oriented) and exploiters (little internal knowledge sourcing and essentially incremental learners, with a high level of external linkages and a broad—but shallow—knowledge base).

Tripsas (1997), through a historical analysis of the evolution of three major firms in the typesetter industry, found evidence of a positive impact of establishing external research links on long-term performance. Her analysis showed that only one firm was able to survive the three stages of competence-destroying technological change that affected that industry in the second half of the 20th century and the successful adaptation of the firm's knowledge base depended upon the capability to source and integrate external knowledge.

In a similar vein, Rosenkopf and Nerkar (2001) found that firms in the optical disk industry with few external links ended up locked into fixed paths of technological evolution. Conversely, firms that adopted a strategy of organisational boundary-spanning exploration, in which managers extensively used the findings of other firms in the industry to inform their own knowledge development, had the highest technical impact, as measured by patent citations.

More recently, however, Laursen and Salter (2006) showed that openness to external knowledge sources can also be taken too far and may be curvilinearly related to innovation performance. They suggested three possible reasons for this finding - an absorptive capacity problem, whereby the firm cannot process the high levels of knowledge it has accessed from outside; a timing problem, whereby external knowledge is brought in at the wrong time or in the wrong place to be useful; and an attention allocation problem, whereby executives are unable to dedicate the necessary attention to the knowledge that is brought in because of other demands on their time.

Despite some criticisms (e.g. Eisenhardt and Santos, 2002:149) that the extant literature is not precise in terms of whether the benefits stem from the knowledge sourcing process per se, as argued by Grant (1996b), from the knowledge gathered during the process, or from some other unexamined factors (e.g. managing resource dependencies or enhancing legitimacy, as conjectured by Podolny and Page, 1998:63), taken together those studies and others (e.g. Allen, 1977; Brown and Eisenhardt, 1998; Katz and Tushman, 1981; McEvily and Zaheer, 1999) indicate that external knowledge sourcing is important for a number of innovation-related outcomes such as patents, patent citations, quality of the product pipeline and introduction of new products.

1.2.3. Global Technology Sourcing

If any firm has the possibility of accessing external technologies, MNCs have the potential advantage of doing so on a global basis.

The idea that MNCs create value from the internalisation of knowledge assets can be traced back to the pioneering work of Hymer (1960), Caves (1971) and Buckley and Casson (1976), among others. The conventional view was that the MNC created knowledge in the home country, which it then diffused worldwide in the form of new products, processes and practices. In the last decade-and-a-half an increasing interest in knowledge as a strategic resource (e.g. Bartlett and Ghoshal, 1989; Gupta and Govindarajan, 1991; Kogut and Zander, 1993) has shed new light on how the MNC creates value from knowledge (Almeida et al., 2002). The change in the focus of research away from the dyadic headquarters-subsidiary relationship in MNCs (Ghoshal and Bartlett, 1990) has led to a new conceptualisation, understanding and appreciation of subsidiaries (Birkinshaw, Hood and Jonsson, 1998; Foss and Pedersen, 2002). Knowledge creation and development occurs not only at the MNC's headquarters but also in the

subsidiaries. And foreign subsidiaries can play a pivotal role in tapping external knowledge from different parts of the world (e.g. Doz et al., 2001). In a nutshell, while the traditional motivation for foreign direct investment (FDI) was mainly based on the MNC's intention to exploit its firm-specific advantages abroad (Hymer, 1960), today with the increasing role of knowledge as the main rationale for the existence of MNCs (Kogut and Zander, 1993), the search for external knowledge is seen as a key driver of foreign direct investment (e.g. Ambos, 2005; Cantwell, 1989; Chung and Alcacer, 2002; Nachum and Zaheer, 2005).

There are a number of ways MNCs attempt to access external knowledge across geographies. In order to surmount the geographic localisation of knowledge (Jaffe et al., 1993), for example, multi-unit firms frequently locate subsidiaries in technologically advanced regions. In a study on the R&D activities of foreign firms in the United States, Dunning and Narula (1995:41) argued that MNCs are prompted to internationalise their activities not only to capture new markets and to cover the increasing costs of R&D "but also to 'scout' for new resources to tap into the benefits offered by the national systems of innovation in different countries". Similarly, Almeida (1996) has shown that subsidiaries of foreign MNCs in the U.S. draw heavily upon the technology of local companies. Almeida (1996:162) also suggests that MNCs being aware of the difficulty of accessing external knowledge from afar use local plants to upgrade the technological ability in areas where they may be weak in their home countries. Using patent data, he shows that foreign firms not only learn more from local sources than expected but also they do so to a greater extent than domestic firms.

In a related vein, Shan and Song (1997), in a study of the biotechnology industry in the U.S., provided empirical evidence that foreign direct investment was drawn to

American biotech firms with high levels of patent activity, suggesting that FDI can be an efficient vehicle for tapping into country-specific, firm-embodied technologies.

Kuemmerle (1997, 1999, 2002) classified R&D subsidiaries in two types: "home-base exploiting R&D" and "home-base augmenting R&D". While the former are useful in helping a firm to better adapt existing products to local needs, the latter are established to conduct R&D that expands the MNC knowledge base by sourcing external knowledge from local organisations in the host country. Interestingly, previous research has shown that knowledge seeking FDI is pursued not only by MNCs that are technological laggards (Berry, 2006) but also by leading technological MNCs aiming at sourcing more diverse knowledge (Cantwell and Janne, 1999).

More recently, a number of scholars (e.g. Chatterji, 1996; Doz et al., 2001; Gassman and Gaso, 2004) have reported that many MNCs establish subsidiaries abroad with the specific mandate (Birkinshaw, 1996; Birkinshaw and Hood, 2000) to access external technologies. For instance, Gassman and Gaso (2004) conducted case-based research in 12 technology-intensive MNCs, headquartered in Germany and Switzerland (e.g. BMW, BASF, Schering, Daimler Chrysler), that used specialised units to access external knowledge in other regions of the world. According to Gassman and Gaso (2004:5) these units began as a typical Japanese phenomenon of the early 1980s, when the Japanese Ministry of Economy, Trade and Industry (METI) "nurtured a national push of fast-follower and imitation strategies, which were accompanied by efficient production systems engineering, kaizen, quality circles and rapid prototyping". Wolff (1992) also suggests that in the 1980s, U.S. companies after realizing that they could no longer meet all their technology needs internally, had decided to scout for overseas technology in a formal, organized way. There are also references in the literature (e.g. Chatterji, 1996) that MNCs in the pharmaceutical industry have used this organisational approach for

many years. Weil (2000) in a study about how European MNCs reach out to Silicon Valley reported that scouting units were a frequent means through which European firms initially settled in the region. Doz et al. (2001) provide anecdotal evidence that other industries like cosmetics also adopt this type of organisational unit, when they describe how Shiseido established a scouting unit to access hotbeds of knowledge about the fragrance business in France (2001:161).

In sum, today there is a broad consensus that a MNC is an international network that accesses knowledge in multiple locations (Almeida, Song and Grant, 2002) and this network-like behaviour of the MNC activity is prompted in part by the fact that there are still distinct differences in the technologies (and other resources) available in different countries (Narula and Hagedoorn, 1999:285). And, in order to be able to identify and access knowledge in different parts of the globe, MNCs often establish subsidiaries with the exclusive mandate (Birkinshaw, 1996; Birkinshaw and Hood, 2000) to scout for opportunities to transfer external knowledge, engaging in what Doz et al. (2001:161) called the "knowledge search mission".

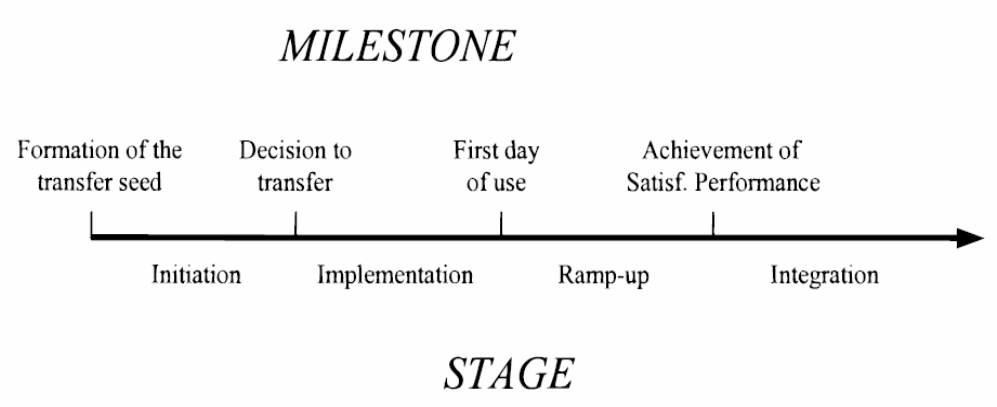
1.3. A PROCESSUAL VIEW OF EXTERNAL TECHNOLOGY SOURCING

Despite all the potential benefits of accessing external knowledge and the effort MNCs are increasingly making to source external technologies on a global basis, in practice, knowledge does not flow uneventfully within the MNC (Szulanski, 1996). There are many barriers to knowledge sharing and the costs involved with knowledge transfers are likely to be substantial (Foss and Pedersen, 2002).

A key contribution to our understanding of the barriers and facilitators to knowledge sourcing was Szulanski's (1996, 2000, 2003) work on the transfer of best practices within the firm[2].

Szulanski (1996, 2000, 2003) challenged the traditional modelling of knowledge transfer as an act. Instead, he posited that knowledge transfer is a process with different stages and suggested that this process view allows a closer examination of how the difficulty in the transfer process—which he labelled knowledge stickiness—evolves over the stages of the transfer (Szulanski, 1996, 2000, 2003). More precisely, Szulanski (1996: 28) divided knowledge transfer into four stages: 1. the *initiation* stage which comprises all the events that lead to the decision to transfer; 2. the *implementation* stage which begins with the decision to transfer and ceases or at least diminishes after the recipient begins using the transferred knowledge; 3. the *ramp-up* stage which begins when the recipient starts using the transferred knowledge (i.e. after the first day of use) and 4. the *integration* stage which begins after the recipient achieves satisfactory results with the transferred knowledge. This four-stage process is depicted in Figure 1.1 below.

Figure 1-1: Stages of a Knowledge Transfer



Source: Szulanski (2000:13)

[2] Szulanski 1996's and 2000's articles had approximately 1,500 and 400 citations, respectively, in March

I argue here that Szulanski's work (1996, 2000, 2003) on knowledge transfers within the firm can meaningfully inform our understanding of the external technology sourcing process as well. If we refer back to the working definition of external knowledge sourcing "as the process of finding, evaluating, acquiring and internalising useful technical knowledge from external sources to complement or extend internal efforts or to diversify the current business and technology base" (Chatterji, 1996:48), it is clear how much a processual view is also appropriate here.

In fact, examining the literature on external knowledge sourcing there are indications that scholars tended to focus their attention on specific stages of the process, even though most often there is no explicit adoption of a processual view.

For instance, in the very first instance of the external knowledge sourcing process, even before a firm starts to look for external knowledge, it has to realise the need for it and check the appropriateness of searching for external knowledge vis-à-vis an internal solution[3]. In this regard, there is a vast body of literature (part of which was reviewed above) indicating the industrial and technological factors driving the increase in external technology sourcing as well as the trade-offs involved in the decision to look for technologies outside the firm boundaries (e.g. Arora et al., 2004; Hagedoorn, 2002; Miotti and Sachwald, 2003; Pisano, 1990; Teece and Armour, 1977; Williamson 1975).

Second, assuming that a focal firm has decided to source technologies externally, the next step is to start looking for opportunities to transfer external knowledge, find some potential alternatives and act on them. This is the stage where I believe there is a gap in the existing literature that should be addressed. I will come back to this point in the next section.

2008, according to Google Scholar.

[3] By suggesting that the knowledge sourcing process occurs in those distinct stages, I am not in any way denying that in many instances the process may take place in a much less orderly manner (e.g. Cohen,

Third, once the external technology has been found and the decision to transfer been made, the focal firm has to decide how to link up with the source of this external technology. The existing literature describes a wide range of modes of governing this relationship from pure arms length contracts to equity investments (e.g. Chiesa and Manzini, 1998; Fey and Birkinshaw, 2004; Teece, 1986; Vanhaverbeke et al., 2002).

Fourth, after deciding to look for external knowledge; having searched, found and evaluated it; and having decided the governance mode of the relationship with the source of the external technology, the external knowledge has to be transferred and integrated into the knowledge base of the focal firm. The issues involved in the integration of external knowledge have also received (and continue to receive) a lot of attention in the literature (e.g. Birkinshaw, Bresman and Hakanson, 2000; Bresman, Birkinshaw and Nobel, 1999; Cohen and Levinthal, 1990; Graebner, 2004; Katz and Allen, 1982; Puranam, 2001; Puranam, Singh and Zollo, 2003; Ranft and Lord, 2002;). Some scholars even argue that "the real source of competitive advantage is knowledge integration rather than knowledge itself" (Grant, 1996b:380).

1.4. RESEARCH GAP AND RESEARCH QUESTIONS

All these stages of the external technology sourcing process have already received some attention from organisational researchers. I suggest, however, that the initiation of the external technology sourcing process – i.e. the initial stage of recognising opportunities to transfer external knowledge and acting on these opportunities—deserves more scholarly attention, notably when it crosses geographic boundaries. As I discuss below, this tends to be a highly complex stage which success is a necessary, although not sufficient, condition for the incorporation of the external technology into the focal firm's

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March and Olsen, 1972). Rather, I am simply suggesting that by analyzing the relevant literature about

knowledge base. Regardless of the relevance of this stage in the overall external technology sourcing process, the extant literature has either analysed it *en passant* or used rough proxies to describe it. More precisely, I suggest there are two major limitations in the extant literature about how firms search for opportunities to transfer external technologies.

First, many times the search stage is taken for granted and the research focus is directed to the subsequent stage in the external technology sourcing process, i.e., on how to govern the relationship with the source of external knowledge, assuming that the desired knowledge source was found.

An excerpt from Vanhaverbeke et al. (2002:716) epitomises this approach: "if a firm resolves to externally source technological know-how, a*nd if it is able to identify another firm that possesses the desired resources* (*emphasis added*), then it still needs to choose a mode for linking up with these resources". In other words, many times the extant literature takes as given 1.that a focal firm resolved to externally source technology and 2.that it is able to identify another organisation that possesses the desired knowledge resources. Based on these two initial assumptions, the focus of many studies has been on either describing different types of business relationships in external sourcing of technology (e.g. Chatterji, 1996; Chiesa and Manzini, 1998) or on identifying the best mode of governing the relationship with the source of the desired and identified external technology given certain contingencies (e.g. Fey and Birkinshaw, 2005; Vanhaverbeke et al., 2002).

The second limitation is that even those studies that aimed at investigating how firms search for external knowledge often end up describing not the process per se but its final result, which obscures the decision processes involved (Szulanski, 2000). In other

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each stage, we can identify where the potential gaps lie.

words, due probably to the difficulty in obtaining data about interfirm search processes—these data are usually not public, or, even when they are available, it is often extremely resource-consuming to assemble (Cohen, 1995; Katila and Ahuja, 2002)—most current studies on how firms search for external technology have used archival patent data as an indicator of search activity (e.g Almeida, 1996; Katila, 2002; Rosenkopf and Nerkar, 2001; Rosenkopf and Almeida, 2003; Sorenson and Stuart, 2000; Stuart and Podolny, 1996). Although patent data provides a good proxy of how firms solved a specific technical problem (Walker, 1995) they do not provide much insight in terms of how the process of searching and identifying an external technology unfolded.

As Ahuja and Katila (2004:903) acknowledged, a major limitation of the search studies using patent data is that they infer "search processes from the paper-trail left in archival documents". Another issue, highlighted by Rosenkopf and Almeida (2003:764) is the interpretation of patent citations as representing knowledge flows. Other studies have interpreted patent data as representing technological similarity (e.g. Mowery et al., 1996) or strategic positioning with regard to patent litigation (Ziedonis, 2002). Also, patent data can only track the external technology sourcing of innovations successful enough to have resulted in patents, while, it is very likely that firms search for external technologies that do not result in granted patents (Rosenkopf and Nerkar, 2001:303). To top it all, patent citation data only indicate the beginning and end points of knowledge sourcing, revealing little in terms of the underlying mechanisms involved in this search process (Almeida, Dokko and Rosenkopf, 2002:312)

Therefore, an important gap in the existing literature about external knowledge sourcing is that while it suggests a firm can access external technologies through many different means, the literature does not properly address the dilemmas involved in the

initial stage of this process, i.e., *how* a focal firm searches, identifies opportunities to transfer external technologies and eventually act (or fail to) on them.

There are many reasons to believe that searching for external technologies is likely to be very complex, notably when it takes place across geographic regions. For instance, if a focal firm, in order to access geographically localized knowledge (Jaffe et al., 1993), decides to establish a unit in a knowledge cluster (Porter, 1990), how does it establish linkages with other firms in the region and at the same time remain connected with the rest of the organisation? The MNC literature (e.g. Birkinshaw and Arvidsson, 2004; Doz et al., 2001; Forsgren, Holm and Johanson, 2005), for instance, suggests that it is very hard for that unit to be embedded both in the internal (with other units within the firm) and external networks (with the local community).

And even when the unit searching for external knowledge is able to embed itself in the local community and identify a promising new technology, it faces the challenge of sharing this knowledge with other units within the firm potentially interested in using it, having to surmount all the known difficulties in transferring knowledge (e.g. Ambos and Ambos, forthcoming; Hansen, 1999; Hansen and Lovas, 2004; Gupta and Govindarajan, 2000; Monteiro et al. 2008; Schulz, 2001, 2003; Szulanski, 1996, 2000, 2003).

The existing literature on external knowledge sourcing (and I suggested somewhere else—Monteiro et al., 2008—that the same gap exists in the literature on intra-firm knowledge transfers) seems to focus on the implementation, ramp-up or integration stages of the knowledge transfer (Szulanski, 1996, 2000, 2003), failing to shed light on how firms deal with initiation stickiness—i.e. "the difficulty in recognizing opportunities to transfer and in acting upon them" (Szulanski, 2000:13).

In other words, regardless of the mode subsequently chosen to govern the transfer (e.g. contract, partnering, equity investment, etc.), the potentially useful external

technology (and its source) has first to be identified and acted upon, which in a multi-unit firm often means that the unit that identified the knowledge is not the same that should act on it. Further, if in a conventional intra-firm knowledge transfer the initiation stage inevitably occurs under some degree of irreducible uncertainty or causal ambiguity and may require months of information collection and evaluation (Szulanski, 1996, 2000, 2003), in the case of external knowledge sourcing this stage tends to be even more complex.

In addition, we know from attention theory (e.g. Bouquet and Birkinshaw, forthcoming; Hansen and Haas, 2001; Ocasio, 1997), more precisely from the principle of focus of attention, that decision-makers are selective in the issues and answers they attend to at any time and that what decision-makers do depend on what issues and answers they focus their attention on (Ocasio, 1997:190). In fact, in a world where decision makers are likely to experience information overload, attention is the scarce resource (Hansen and Haas, 2001). Therefore, it is bound that a number of opportunities to transfer external technologies will not receive any attention from decision makers. It happens, however, that most existing research do not take into account those "missed" opportunities. Instead, what is typically observed are only those opportunities to transfer external knowledge that have been followed-up by the in-sourcing firm. In other words, we know only about those opportunities to transfer knowledge that have been acted upon by the MNC (e.g. external patents that have been cited, research and development agreements that have been established, corporate venture investments that have been made).

In a nutshell, we lack a better understanding not only of how the initiation stage of this process unfolds but also of the patterns that may explain why some opportunities to source external technologies are acted upon while others are not.

I suggest in this dissertation that these are fundamental questions in regard to the process of sourcing external technologies that cannot be answered by the existing literature, either because scholars have so far focused on a subsequent stage of the external technology sourcing process (e.g. the integration of external knowledge) or because the studies on search behaviour used a data structure (patent records) that does not (and cannot) provide the level of granularity required to unveil the complex mechanisms involved in this process. Not surprisingly, many scholars would agree that only direct observation and measurement of such process and "detailed, painstaking fieldwork" (Rosenkopf and Nerkar, 2001:303) could bridge the gap in this literature.

In sum, external knowledge sourcing is a multi-staged process and there seems to be a lack of fine-grained systematic research on the initial stage of *how* firms search and identify opportunities to transfer external technologies across geographies and on *why* some of those opportunities are acted upon while other receive no action.

This dissertation aims at addressing this gap in the literature. More precisely, I address three research questions in this manuscript:

1) What is the process through which MNCs search for, identify and act upon (or fail to) opportunities to transfer external technologies across geographic boundaries?

2) What are the barriers and facilitators that explain why some opportunities to transfer external technologies are acted upon while others receive no action?

3) What is the relative impact of those barriers and facilitators on the likelihood of a successful initiation—i.e. on the chances of an opportunity to transfer an external technology being acted upon?

I suggest below a research design that combines both qualitative and quantitative research methods and two distinct, although related, studies. The first study (a qualitative piece), described in detail in the Chapters 3 and 4, addresses the *how* and *why* questions

above. The second study, described in Chapters 5, 6 and 7, goes one step further and tests the relative impact of specific factors that emerged from the inductive study on the likelihood of a focal opportunity to transfer external technologies being acted upon (i.e. the *how much*). While the qualitative study focused on the technology scouting *process*, the quantitative paper focuses on its *outcomes*.

Two important clarifications about the boundary conditions of this dissertation are required at this stage.

First, my point of departure is that a focal MNC has already decided to source knowledge externally in another country. Hence, I will not try to explore the reasons why a focal firm decided to source technologies externally or why some firms engage in external knowledge sourcing while other do not and so on. This initial decision is taken as given. Similarly, it is not my intention to proceed to the next step in the external knowledge sourcing process and discuss the trade-offs between different governance modes for internalising the external technology once it has been found. In this manuscript, I focus exclusively on the initiation stage (Szulanski, 1996, 2000, 2003).

Second, I will focus only on the formal, organised process of searching for external knowledge vis-à-vis a possible alternative approach of observing the dispersed (and to a certain extent chaotic) search processes that may occur all around the organisation. In other words, my research does not focus on the cases where there is a broad diffusion of responsibility for external knowledge sourcing, i.e., when search for external knowledge is a normal accompaniment of everyone's internal responsibilities (Chatterji and Manuel, 1993). My approach here is similar to Birkinshaw and Hill's (2004) focused mode of corporate entrepreneurship, Zahra, Jennings and Kuratko's (1999) "formal venturing" approach or the idea of dedicated scanning units formally responsible

for the organisational scanning effort (e.g. Diffenbach, 1983; Ghoshal, 1985; Lenz and Engledow, 1986; Stubbart, 1982).

CHAPTER 2. EMPIRICAL SETTING

2.1. SITE SELECTION

2.1.1. Technology Scouting Units

As reviewed above, the existing literature mentions a number of ways MNCs organise their search for external knowledge across geographic regions (Almeida, 1996; Gassman and Gaso, 2004; Kuemmerle, 1997, 1999; Rosenkopf and Almeida, 2003). A natural empirical setting to conduct my studies is in MNC subsidiaries whose mandate (Birkinshaw, 1996; Birkinshaw and Hood, 2000) is to access external technologies.

One option would be to focus on subsidiaries doing home-base augmenting R&D (Kuemmerle, 1997, 1999). These units are established with the specific objective of "absorbing knowledge from the local scientific community, creating new knowledge and transferring it back to the company's central R&D site" (Kuemmerle, 1997:63). There are, however, three potential problems in using home-base augmenting R&D units as the empirical setting for my research. First, recent empirical evidence seems to show that MNC subsidiaries are increasingly playing both home base augmenting and home base exploiting roles, in other words, they exploit their existing knowledge bases and augment their knowledge at the same time (e.g. Almeida and Phene, 2004; Kuemmerle, 2002). Second, these R&D units usually access the externally sourced technology for their local use before they share it with other units within the MNC. Therefore, the final recipient of the technology within the firm may find it difficult to disentangle what is external from internal knowledge. Third, these R&D sites tend to focus on links with the scientific community, failing to focus on start-ups that are an increasingly important source of new technologies (Chesbrough, 2003a).

I suggest, thus, that a more appropriate empirical setting for this research are those units exclusively created to search for external knowledge. As reviewed above, a number of MNCs have recently established subsidiaries with the specific purpose of accessing external technologies. Some authors call those units technological listening posts (Gassman and Gaso, 2004; Patel and Vega, 1999; von Zedwitz and Gassman, 2002); others dedicated sensor units (Doz et al., 2001: 160) while practitioners usually refer to technology scouting units. The Roget's II: The New Thesaurus (1995) define scout as "to go into or through for the purpose of making discoveries or acquiring information: delve, dig, explore, inquire, investigate, look into, probe, reconnoitre".

I believe scout reflects very well the purpose of those units. Therefore, building on Gassmann and Gaso (2004) and Birkinshaw and Hill (2004), I define technology scouting units as a separate entity (in an organisational sense, but not necessarily from a legal perspective) established by the large firm with the specific strategic purpose of searching for opportunities to transfer external technologies and letting other units within the firm know about these opportunities.

These technology scouting units share some similarities with corporate venture units, especially "Ecosystem Venturing Units" (Birkinshaw and Hill, 2004; Campbell, Birkinshaw, Morrison and van Basten Batenburg, 2003), to the extent that they also are a separate entity with a focus on finding potentially useful external knowledge that can be explored by the rest of the organisation. Their search target is, to a certain extent, also similar to Chesbrough's (2002) "Emergent" type of corporate venture capital investment that searches for new ideas that would allow the exploration of potential new businesses as well as his "Enabling" type that looks for external knowledge that could complement the strategy of the focal firm's current business. The key difference is that while corporate venture units have the specific focus on finding *investment* opportunities, technology

scouting units have a broader search scope: they look for external technologies with no mode of governance established a priori. In other words, the objective of a scouting unit is to find promising opportunities to transfer external technologies and flag them to other units within the organisation, with no pre-established judgment in relation to the way the external knowledge should be internalised, i.e., scouting units identify opportunities to transfer external technologies that may be materialised through arm's length contracts, R&D agreements, equity investments, among others.

I should also highlight that technology scouting units do not confound with the conventional environmental scanning units described in traditional scanning studies (e.g. Diffenbach, 1983; Ghoshal, 1985; Lenz and Engledow, 1986; Stubbart, 1982). Although scouting and environmental scanning units are similar to the extent that they are both dedicated units to scan the environment, their organisational role and search targets are very different. The central focus of the conventional environmental scanning units was "to gather and interpret pertinent environmental information and introduce the results of the analyses into an organisation's decision processes" (Lenz and Engledow, 1986:69). In other words, environmental scanning, in that context, means monitoring environmental information and informing the strategic planning process. The main objective of the technology scouting units described in this study, on the other hand, is to search for external knowledge that could be somehow internalised (be it through R&D agreements, alliances, contracting, equity investment, etc.) leading eventually the focal firm to produce more innovative products and services. In a nutshell, my focus in this research is on the organised firm effort to search for opportunities to transfer external technologies.

It seems evident that the dedicated nature of these technology scouting units offers some important advantages. As Doz et al. (2001:161) pointed out these units can afford to pursue their "knowledge search mission" free from the constraints of being an operating

unit, and they can be established in areas where the company has no other operation at all, enabling a focal firm to access pockets of knowledge where it may not make sense to have a sales, manufacturing or even an R&D operation. More importantly, Doz et al. (2001:161) highlight, technology scouting units have the "potentially important role in unearthing new knowledge that lies outside the reach of a company's existing operational network (either because this knowledge exists in places where the firm does not operate or because prejudices within the established organisation make it impossible to access)". There are also potential risks in establishing a dedicated technology scouting unit that is not involved in day-to-day operations. For instance, these units face the possibility of becoming isolated from the rest of the organisation or lacking the necessary absorptive capacity (Cohen and Levinthal, 1990) to identify emerging market trends because they are not closely engaged with sales and distribution.

It should be clear that I am not positing in this study any superiority of technology scouting units vis-à-vis other means of searching for opportunities to transfer external technologies. Also, it is not the main focus of my research to investigate the reasons why a focal firm decided to establish a determined technology scouting unit. It could be a natural consequence of a well-thought strategic process or simply the result of institutional isomorphic pressures—"all our competitors have one of those units so we should do the same" (e.g. DiMaggio and Powell, 1983). Notwithstanding the importance of such questions, they are not the main focus of my research.

My only proposition in relation to technology scouting units is that, once established, they provide a very appropriate empirical setting to investigate how a MNC searches for opportunities to transfer external technologies from another geographic location. Because they are not involved in other operational activities, virtually all their activities are part of the external technology scouting process. Therefore, while in other

empirical settings it may have been harder for the researcher to disentangle daily operational activities from search activities; here the vast majority of the technology scouting unit's activities should be an integral part of the initiation (Szulanski, 1996, 2000, 2003) of the external knowledge sourcing process.

2.1.2. Silicon Valley

In addition to providing the opportunity to observe the initiation of the external technology sourcing process with a minimum of noise (i.e. not mixed with other operational activities), an ideal research setting would have a high level and diversity of deal flows which would enable the researcher to observe numerous and distinct search episodes in a reasonable period of time.

It is possible to find technology scouting units in different regions or clusters (Porter, 1990) around the world—chemical technologies in Basel, Switzerland; biotechnology in Boston; material science in central Germany, just to mention a few—but perhaps the region where technology scouting units are most prevalent is in Silicon Valley, California.

Geographically speaking, Silicon Valley usually refers to an area of about 25 miles long and 10 miles wide that extends northwest from San Jose, up to the San Francisco peninsula, which is roughly equivalent to Santa Clara County and Southern San Mateo County (Gregory, 1983; Philips and Zuckerman, 2001). Kenney (2000), in his edited book "Understanding Silicon Valley—An Anatomy of an Entrepreneurial Region", explains that Silicon Valley is not a formal geographic area but, in practice, it encompasses much of San Mateo and Santa Clara counties, from San Carlos in the north to San Jose in the south. Please see Appendix 1 for a Map of Silicon Valley. There are

even some authors who extrapolate its already loose geographic boundaries to use Silicon Valley as a metaphor to represent high-technology industry in California, and the United States in general (e.g. Teece, 1992).

Historically, according to Philips and Zuckerman (2001:392), Silicon Valley initiated its transformation from an agricultural to a technological economy at the end of the World War II, after the introduction of Department of Defence Funding which ended up leading to the creation of many organisations such as Hewlett Packard and SRI (Stanford Research Institute). According to other accounts (e.g. Sturgeon, 2000), the development of a climate for electronics innovation, entrepreneurship and spinoffs (key characteristics attributed to the region today) dates back to the formation of the Federal Telegraph Corporation in 1909. Others refer to the importance of William Schockley leaving Bell Labs to start Schockley Semiconductors in Palo Alto, his assistants leaving his firm to form Fairchild Semiconductors in 1957, and how the origins of almost every firm in the Silicon Valley can be traced to Fairchild (Almeida and Kogut, 1999:907). More importantly, all these changes lead start-ups to play an important role in the diffusion of knowledge in the region (e.g. Almeida and Kogut, 1999; Moore, 1986). To top it all, the existence of state-of-the art research in top universities in the area, like University of California at Berkeley and Stanford University, created the right environment for local diffusion of knowledge (e.g. Almeida and Kogut, 1999; Jaffe et al., 1993; Kenney, 2000; Leslie and Kargan, 1996).

In any case, before the late 1960s, there had been little attention, even within the U.S., to the development of a critical mass of technology-based firms that facilitated the emergence of a semiconductor industry in the Santa Clara Valley. It was only after the region was named Silicon Valley (in reference to “silicon chips”), in 1971, by Dan Hoefler, a reporter for Electronic News, that region became known to the general public

(Gregory, 1983; Kenney, 2000; Philips and Zuckerman, 2001). Over time, Silicon Valley became the dominant location for a set of electronics/data communication companies that includes semiconductor and hard disk drive manufacturers, local and wide-area networking equipment suppliers, biotechnology and software firms and Internet companies (Kenney and Von Burg, 2000:218).

Recent studies (e.g. Bahrami and Evans, 2000; Cohen and Fields, 2000; Kenney and Von Burg, 2000) provide structural and organisational explanations for the development of the region and attribute the success of Silicon Valley to one or a combination of the following: proximity to research universities (Storper, 1993; Storper and Salais, 1997); cutting-edge technology; abundance of venture capital and entrepreneurship (Gilder, 1989); supplier networks (Saxenian, 1994) and labour mobility (Angel, 1991; Saxenian, 1994).

Today, it should be fair to say that Silicon Valley has perhaps attracted more scholarly (and also managerial) attention than any other cluster in the world[4]. In fact, many of the studies cited in sections above, and in particular those that refer to how firms attempt to access localized knowledge (e.g. Almeida, 1996; Almeida and Kogut, 1999; Gassman and Gaso, 2004; Jaffe et al., 1993) have Silicon Valley as their empirical setting or, at least, as one of their settings.

A few years ago, still before the dot-com debacle, Kenney (2000:1) pointed out that "over the last four decades, Silicon Valley firms have commercialised a number of the most important electronics and biomedical technologies developed in the second half of the twentieth century. (…) It is difficult to think of any other region that has been able to commercialise so many significant new technologies in such a short period of time".

[4] A search of the expression "Silicon Valley" at Business Source Complete in March 2008 returns approximately 4,200 articles, almost 400 of them published in academic journals.

Kenney's (2000) quote above reflects well the reason I believe Silicon Valley is the ideal setting for the two studies I am proposing in the next sections: Silicon Valley is likely to be the best place to observe the emergence of a large quantity of important technologies in a reasonably short period of time. I stressed the word "quantity" because my choice of Silicon Valley is due much more to the possibility of observing a high number of external technology sourcing processes being initiated, rather than to any of its idiosyncrasies. In other words, I argue here that for the purposes of observing how firms search, identify and act upon opportunities to transfer external technologies, Silicon Valley is, *mutatis mutandis*, qualitatively comparable to other knowledge hotbeds in the world (e.g. the Boston area, Massachusetts or the Cambridge area in the United Kingdom), i.e., what really makes it different from other regions, at least in the context of the initiation of the external knowledge sourcing process, is a matter of degree (higher number of external technologies available) rather than a matter of kind[5].

2.1.3. The Telecommunication Services Providers Industry

Finally, a setting where technology scouting has been particularly prevalent in the last few years is the telecommunication services providers industry.[6] Firms in this industry are primarily engaged in operating, maintaining, and/or providing access to facilities for the transmission of voice, data, text, sound, and video, using wired (NAICS 5171) or wireless (NAICS 5172) telecommunications networks[7]. For example, AT&T,

[5] This seems to be in line with Kenney and Von Burg (2000) argument that the *differentia specifica* of Silicon Valley, i.e., the trait that sets it apart from most regions of industrial clustering is the existence of an "Economy Two" which is populated by organisations (e.g. law firms, marketing organisations, accounting firms and so on) whose sole purpose, or a significant component of their business, is related to servicing start-ups.

6 North American Industry Classification System (NAICS) 517, which corresponds roughly to old Standard Industrial Classification (SIC) code 4813

[7] I am not including here firms primarily engaged in *manufacturing* wire telephone and data communications equipment (NAICS 334210, Telephone Apparatus Manufacturing) or radio and television broadcast and wireless communications equipment (NAICS 334220 Radio and Television Broadcasting and

British Telecom, Cingular, Deutsche Telekom, DoCoMo, France Telecom, NTT, Verizon, Vodafone and Telefonica, just to mention a few, are all major players in this industry.

In the late 1990s and early 2000s, there has been an extraordinary rate of convergence between fixed and mobile telephony but equally importantly have been the increasing intersections with other industries such as consumer electronics, software development, gaming, media content providers, among others. Convergence in network platforms, for example, could offer traditional analogue applications, such as voice phone calls, to be offered on digital platform, with voice over internet protocol (VoIP) being the main example. Wireless and fixed line networks were also converging and industry analysts expected that the boundaries between fixed and mobile networks would blur as additional spectrum, such as WiFi and WiMAX (Worldwide Interoperability for Microwave Access), roaming across both. Similarly, TV services delivered over broadband connections (IPTV) represented an example of convergence of services. Convergence was also happening at the device level where telephones could operate on both fixed and mobile network, mobile phones provided mobile TV services and PCs provided internet as well as voice services. Please see Appendix 2 for a pictorial description of the telecommunication services providers' value chain.

These trends combined required telecommunications service providers to intensely recur to different sources of external technologies in order to be able to offer innovative services to ever demanding customers.[8] In fact, in the early 2000s, many in the

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Wireless Communications Equipment Manufacturing). Firms in those industries are mainly involved in the *manufacturing* of telecommunication products, such as transmitting and receiving antennas, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment, central office switching equipment, telephones, telephone answering machines, LAN modems, multi-user modems, and other data communications equipment, such as bridges, routers, and gateways.

[8] Godell (2004b:2) suggests why change in the way telcos innovate was necessary "Traditionally, the dominant telco culture has focused on internal needs, not those of customers. Telcos reward R&D employees for participation in international standardization bodies and for publishing papers. More recently, they have rewarded employees for filing patents. Between 1996 and 2001, European telecom

telecommunications industry saw a trend towards growing standardization on the Internet Protocol and an increasing focus on commercializing new technologies rather than inventing them internally. For instance, in a study of best innovation practices in the telecommunications sector, Godell (2004a) showed that five key telecommunication players in Europe (Deutsche Telekom, Telenor, Telecom Italia, France Telecom and British Telecom) were increasingly relying on external technology sourcing. And KPN, the Dutch telecom, took external technology sourcing to the extreme by giving away its R&D lab (KPN Valley) to the Dutch Organisation for Applied Scientific Research (TNO) in January 2003[9].

All those factors taken together suggest that the telecommunication services providers industry is an attractive industry for conducting this research.

2.2. CASE SELECTION

2.2.1. Pilot Study

I initially approached four major European multinational companies operating in the telecommunication services providers industry (two headquartered in the United Kingdom and two in Continental Europe), all of them with scouting units in Silicon Valley. I first contacted managers that I (or my thesis advisor) had some previous ties with, explained that I was interested in studying external knowledge sourcing and requested them to arrange meetings with appropriate managers.

Please see Appendix 2 for a sample invitation letter. In this first phase of the pilot study, I conducted twelve phone and face-to-face interviews with corporate managers of

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patent filings grew 167%. But on average less than 10% of patents have commercial relevance, and less than 1% have critical importance".

[9] According to KPN's Annual Report and Form 20-F 2003, p.30

those four MNCs, one way or another involved in the external technology scouting process.

Given their position in corporate headquarters, however, most of my interviewees were only potential recipients of the external technologies rather than being in the front scouting them. It soon became clear, thus, that in order to observe the initiation of the external technology scouting process I had to interview the managers who were directly involved in the searching effort. My access to the managers in the scouting units was then facilitated by the corporate managers.

The second phase of the pilot study consisted of ten face-to-face semi-structured interviews with the managers responsible for the technology scouting units in the Silicon Valley.

By asking respondents to walk me through real examples, I tried to structure the interviews in such a way that theyt would provide me with some initial insights on the process of searching for external technologies. Most of the interviews were recorded with the permission of the interviewee and transcribed. I also took copious notes during the interviews and in many cases the interviewees provided me with diagrams and charts on a white board to explain concepts around which clarifying questions were asked. More importantly, they showed me (although at that stage they did not provide me with copies) slides, emails and other documents to illustrate real cases of how they search for opportunities to transfer external technologies.

In sum, the pilot study consisted of two phases: in the first phase I interviewed twelve senior managers at the firms' HQs; while in the second phase I visited the scouting units in Silicon Valley and interviewed ten senior managers responsible for such units.

These initial interviews were instrumental in familiarising myself with the setting and jargon and provided me with important insights about the technology scouting

process in the telecommunications service providers industry. This pilot study also indicated that, to a large extent, the process through which those firms searched for external technologies was quite similar.

2.2.2. Study site

After the pilot study, it became clear that the data requirements to examine the technology scouting process would be extensive and that it was unlikely that I would get the necessary level of data access in multiple companies. Similar to other knowledge transfer studies (e.g. Haas, 2006a, 2006b; Hansen, 1996, 1999; Hansen and Haas, 2001; Hansen and Lovas, 2004), I thus opted to limit my analysis to one single company[10]. This one-site approach required, however, a large firm with many instances of external technologies being scouted so that I could meaningfully model the external technology scouting process. I managed to negotiate access to one very large corporation.

Europ Telco (a pseudonym), one of the companies that participated in the pilot study, agreed to provide me, upon the signature of a non-disclosure agreement, with ample access to its archives, to all its relevant managers involved with technology scouting and to a proprietary database with 137 external technologies scouted by the company in a three-year period (from January 2003 to December 2005).

In 2007, Europ Telco was one of the largest telecommunications service providers in the world. The company was headquartered in Europe and had annual revenues of more than USD 30 billion in 2006. Similar to other incumbents in this industry, Europ Telco was still the dominant telecommunications player in its home country but the revenues from its traditional businesses were declining significantly. A combination of

[10] Although, for a given set of available resources, the fewer the number of cases, the greater the opportunity for depth of observation, single cases have important limitations, notably the generalisability of

market deregulation and the convergence of formerly distinct industries presented incumbents like Europ Telco with an intensity of competition that many executives believed was unprecedented in the industry. In addition, there seemed to be a consensus in the industry that the revenue decline in the incumbents' traditional market was likely to accelerate in the future. In order to reverse this revenue decline, incumbents, including Europ Telco, developed "New Wave" services (e.g. Broadband and Mobility) and were betting that the accentuated growth in the demand for those new services would offset the decline in their conventional revenues.

In terms of geographic scope, Europ Telco had a global presence and its global internet protocol (IP) infrastructure was used in more than 100 countries and already connected more than 160,000 customer sites in 2005. Nevertheless, in the mid-2000's approximately two-thirds of its revenues were derived from operations in its home country.

Europ Telco also had a long history of technological innovations with a total portfolio of a few thousands patents and applications. The company invested more than USD 1.2 billion in research and development (R&D) in the 2005/06 financial year. Despite its huge patent portfolio and substantial investment in R&D every year, Europ Telco's management was convinced that the firm needed to identify and access external sources of innovation and build strategic partners globally. More precisely, in the early 2000s Europ Telco reorganized its R&D function to enhance its ability to identify, understand, select from, and connect to the wealth of available external knowledge. It was then established that a key R&D objective would be to identify global sources of innovation (product, service, process, social), seed them into the lines of business and lead hot house innovation processes within the firm.

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its conclusions and models of theory (Voss, Tsikriktsis and Frolich, 2002:201). I will address these issues in the last chapter of this dissertation.

It was in this context that Europ Telco established a scouting unit in Palo Alto, California in 2000. Subsequently, Europ Telco also established scouting units in Tokyo (2005) to cover both Japan and South Korea and in Beijing (2006) to cover the Chinese market. Europ Telco also assigned one of its scouters in Silicon Valley with the job of covering the Israeli market. Those units were wholly-owned subsidiaries of Europ Telco and were staffed by career managers, most of them with more than ten years of experience in the company. Appendix 4 provides short bios (names are disguised) of the main managers responsible for technology scouting at Europ Telco.

CHAPTER 3. QUALITATIVE STUDY - METHODOLOGY

3.1. INTRODUCTION

Due to the lack of prior theory and research regarding the *process* of how MNCs search for, recognise and act upon opportunities to transfer technologies across geographic and organisational boundaries, the research approach I used in this study is grounded theory-building (Strauss and Corbin, 1990). This method allows for a close correspondence between theory and data, a process whereby the emergent theory is "grounded" in the data (Eisenhardt, 1989; Glaser and Strauss, 1967). The rich data available from the field is likely to be better suited to help uncover hitherto unsuspected relationships between the independent and dependent variables in a process theory (Eisenhardt, 1989; Miles and Huberman, 1994; Yin, 2003). The research design is an in-depth single-case study and I used an embedded design (Yin, 2003) through which I collected data on multiple levels of analysis, as described below. Yin (2003) suggests that case studies are particularly suited to explore "how" questions that either lack a strong theoretical prior, or to choose between competing theories that explain a phenomenon.

As Srikanth (2007) explains, however, recently many qualitative researchers (e.g. Eisenhardt and Graebner, 2007; Siggelkow, 2007; Suddaby, 2006) have suggested that those who embark on theory building studies should keep in mind prior theories that speak to these issues and collect data for those constructs apart from keeping an eye open for new constructs and relationships. Eisenhardt (1989:536) suggests that theory building research should begin as close as possible to the ideal of no theory under consideration and no hypotheses to test. Admittedly, however, it is impossible to achieve this ideal of a clean theoretical slate. Siggelkow (2007:21) goes even further and suggests that entering

the field with an "open mind" is good but with an "empty mind" is not. I have entered the field with an approach similar to Siggelkow's (2007): although there is a lack of prior theory and research regarding the technology scouting *process*, knowledge sourcing in MNCs is a "well-tilled soil" so this dissertation is an example of field-based research that not only can unveil new constructs and relationships but also can "sharpen existing theory by pointing to gaps and beginning to fill them" (Siggelkow, 2007:21)[11].

3.2. DATA COLLECTION AND ANALYSIS

I followed Yin (2003) concerning data collection and used the following data sources: 1. semi-structured interviews with all relevant managers involved with technology scouting; 2. publicly available data, including company Web sites and business publications; 3. materials produced inside the firm, notably an internal proprietary database; 4. field observations; 5. phone calls, emails and follow-up interviews. Data collection occurred primarily through semi-structured interviews.

More precisely, I conducted 52 interviews in Europe, the United States and Asia from December 2004 to October 2007. I interviewed all senior managers working in the scouting units and some key informants were interviewed as many as six times over a 34-month period. It is important to highlight that in my data collection process, I took steps to minimise informant biases. My informants included multiple individuals from the scouting units; from Europ Telco's corporate headquarters and also from managers working in Europ Telco's lines of business. Those different managers are likely to have different perspectives (and possibly interests) about the technology scouting process. And previous literature has shown that multiple informants mitigate subject biases (Golden, 1992; Miller, Cardinal and Glick, 1997) and lead to a richer, more elaborated model. A

[11] This approach will also be evident in the quantitative study described in Chapters 5-7.

list of all my informants, their position in the company, together with the description of the type and number of interviews is included in Table 3-1 below.

The initial interviews were 60-150 minutes and followed an interview guide that had variations for managers working at the scouting units vis-à-vis corporate managers or lines of business managers. In the initial interviews, informants provided me with retrospective information about the establishment of the scouting units and their evolution over time. In addition, I collected in these initial interviews background information about my informants. Please see Appendix 5 for the Interview Guide of this first round of interviews.

In a second round of interviews, I developed an interview guide that consisted of two main sections. In the first section, I asked informants to describe their relationship with the corporate parent. In the second section I was interested in obtaining more detailed information about the scouting unit's relationship with local companies and venture capitalists. Appendix 6 provides the Interview Guide for the second round of interviews.

Most of the interviews were recorded with the permission of the interviewee and transcribed. If any further clarification was necessary, I sent follow-up emails and conducted additional interviews on the phone. I also took copious notes during the interviews and in many cases the interviewees provided me with diagrams and charts on a white board to explain concepts around which clarifying questions were asked.

In order to mitigate possible impression management and cognitive biases in the collection of retrospective information, informants were asked to place themselves back in time, instead of providing their opinion as to what occurred (Huber and Power, 1985; Miller et al., 1997). Following Eisenhardt's (1989) recommendation, I followed a "courtroom" procedure trying to centre informants' attention on facts and events, by

reminding them of facts and dates I had obtained through (internal and external) archival sources. On top of that, I triangulated this data with the information obtained from different informants within and outside the firm (Jick, 1979). For instance, I also interviewed partners of three venture capital firms with whom Europ Telco had relationships and managers from three start-ups scouted by Europ Telco.

The other key component in my data collection effort was the access to Europ Telco's internal documents. More precisely, as I describe in detail below, the standard procedure adopted by Europ Telco's managers to transfer their knowledge about the external technologies they identified was to complete a standardised form containing detailed information about the external technology, its source and its relevance to Europ Telco. This form was known at Europ Telco as the "transfer-memo". Please see Table 3-2 below for the fields in this form and Appendix 7 for an example of a complete transfer memo (names, technologies and organisations are disguised). It is worth noting that while most empirical studies on knowledge transfers relied on perceptions of whether knowledge was transferred (e.g. Ambos and Ambos, forthcoming; Gupta and Govindarajan, 2000; Monteiro et al., 2008), the transfer-memos provide a rare opportunity to objectively observe the knowledge that has been transferred from the scouting units to other units within the MNC.

All those completed forms are kept in a proprietary database called Rock. At the beginning of 2006, i.e. roughly one year after the start of my field work at Europ Telco, I have been given access, upon the signature of a non-disclosure agreement, to 137 entries in the Rock database regarding the external technologies assessed in the period between January 2003 and December 2005. Given this time period, which preceded the

establishment of the scouting units in Japan/Korea and China, my sample covers only entries input by scouters based in the Silicon Valley scouting unit[12].

After several months analysing Rock database, I engaged in a third round of interviews with the scouters. The main objective of those interviews was to have a detailed description of how the memos were written; to understand how each field in the memo was completed and to identify possible reasons for variance among different memos. More precisely, I split the 137 memos according to their lead contact within Europ Telco's (i.e. the scouter who wrote it) and in my interviews I showed the scouters hard copies of memos they have written. I typically asked my informants to walk me through the process of writing those memos, discussing the importance and the role of each field in the memo. In many instances, I asked scouters to compare memos and to explain the reasons for the differences among memos. I also asked my informants to select two types of transfer-memos: the first one with the memos that were followed-up by the recipient unit and the second group with the memos that received no action.

Further, I asked the scouters to list a number of factors they attribute to the success/failure of the initiation of the transfer of a specific external technology. I asked them to list not only the inherent characteristics of the external technologies (and of their sources) but also features of the scouting process itself.

[12] Although those entries also encompass companies based in Europe, Israel and Asia, all of them were input by the Silicon Valley scouting unit. This is due to the fact that, by the end of 2005, the scouting units in China and Japan/Korea were not yet operational. Although I have interviewed the scouters in those other scouting units, my data does not allow me to triangulate their interviews with their entries in the Rock database. Therefore, I will not be able to provide a robust comparison of the patterns among different scouting units. This is an important limitation that I will discuss in the last chapter of this dissertation.

Table 3-1: List of Informants

	Title of Inofrmants	Medium	Location	Number of interviews	Corporate/Scouting Team/LOB
1	Senior VP, Technology&Innovation	Face to face and Telephone	Silicon Valley	6	Scouting team
2	VP, Business Development	Face-to-face and telephone	Silicon Valley	4	Scouting team
3	VP, Technology	Face-to-face	Silicon Valley	3	Scouting team
4	Director, Global Scouting Operations	Face-to-face	Silicon Valley	3	Scouting team
5	Technology Director	Face-to-face	Silicon Valley, Israel	3	Scouting team
6	VP, Technology&Innovation	Face-to-face	China	2	Scouting team
7	VP, Technology&Innovation	Face-to-face and telephone	Japan/Korea	2	Scouting team
8	Manager, Innovation	Face-to-face	Europe	2	Scouting team
9	Head, Applied Technology Centre	Face-to-face	Europe	2	Scouting team
10	Project manager, Applied Technology Centre	Face-to-face	Europe	1	Scouting team
11	Group Chief Technology Officer	Face-to-face	Europe	2	Corporate
12	Director, Market Developments	Face-to-face	Europe	1	Corporate
13	Director, Research and Venturing	Face-to-face	Europe	2	Corporate
14	Head of Strategic University Research	Face-to-face	Europe	1	Corporate
15	Head Strategic Research	Face-to-face	Europe	1	Corporate
16	Manager, Corporate databases	Face-to-face	Europe	1	Corporate
17	Manager, Foresight	Face-to-face	Europe	1	Corporate
18	Specialist, Strategy	Face-to-face	Europe	2	Corporate
19	Manager, Business Development	Face-to-face	Europe	1	Line of business (LOB)
20	Director of Technology Strategy and Development	Face-to-face	Europe	1	Line of business (LOB)
21	VP of Strategy & Business Development	Face-to-face	Europe	1	Line of business (LOB)
22	General Manager, Business Transformation	Face-to-face	Europe	1	Line of business (LOB)
23	Head, Strategic Programmes	Face-to-face	Europe	1	Line of business (LOB)
24	Director, Value Added Services & Devices	Face-to-face	Europe	1	Line of business (LOB)
25	Head, Business Sector Programme	Face-to-face	Europe	1	Line of business (LOB)
26	Business Management Director	Face-to-face	Europe	1	Line of business (LOB)
27	Account director	Face-to-face	Europe	1	Line of business (LOB)
28	Senior Business Manager	Face-to-face	Europe	1	Line of business (LOB)
29	VP Business Development	Face-to-face	Europe	1	Line of business (LOB)
30	Account director	Face-to-face	Europe	1	Line of business (LOB)
31	Business Manager	Face-to-face	Europe	1	Line of business (LOB)

Table 3-2: Field Labels of the Transfer Memo

1	Company Name
2	Date Last Seen
3	Technological Domain
4	Product Overview
5	Product Description
6	Relevance to Europ Telco
7	Comments
8	Market
9	Competitors
10	Customers
11	Maturity of company
12	Date established
13	No of employees
14	Financing
15	Source of Lead
16	Lead Europ Telco Contact
17	Contact (2)
18	Contact (3)
19	URL
20	Address
21	Headquarters / Region
22	Other location(s)
23	Contact name
24	Contact job title
25	Contact telephone
26	Contact email

Finally, I have also interviewed thirteen managers in the lines of business and asked similar questions regarding specific transfer-memos sent to them.

I followed the data analysis methods suggested by Eisenhardt (1989); Miles and Huberman (1994) and Yin (2003) and vastly applied in the literature. First, I entered all transcribed responses into a database indexed by interview number. Upon completing all of the interviews, I synthesized the interview transcripts, notes from my on-site observations and secondary data into a single case story. As is typical in inductive research, I experienced a frequent overlap of data collection with data analysis (Glaser and Strauss, 1967). More precisely, I cross-checked the transcripts of my interviews with

the detailed data contained in the Rock database, identified potential gaps and/or contradictions and did many clarification interviews. Having permanent access to the Rock database, the company's managers both in Europe and in the scouting units was fundamental in this process.

In other words, data analysis and data collection in many instances proceeded as an iterative process in which I refined interview questions to pursue emerging themes. Then I compared the emergent concepts, theory or hypotheses with the extant literature, asking what is this similar to, what does it contradict, and why (Eisenhardt, 1989:544). As a check on the emerging case story, I asked another researcher to read through the original interviews and form an independent view of the case. This independent view was then used to cross-check the emerging story and provided a richer and more triangulated story for the process under study. This iterative process led to the results presented in the next chapter.

CHAPTER 4. QUALITATIVE STUDY – FINDINGS

External knowledge sourcing has been broadly defined in the literature as the process by which managers identify and gain access to relevant knowledge that is being created in the external environment (Eisenhardt and Santos, 2002:145). Here, I adopt Bingham and Eishenhardt's (2005:11) definition of organisational process as "the collection of organisational rules, heuristics, or guidelines that enable managers to accomplish a key task". And I examined the technology scouting process by assessing the heuristics and guidelines managers used to search for opportunities to transfer external technologies and how they share their knowledge about those opportunities with other units within the firm.

What emerged from my data was a nuanced description of the initiation (Szulanski, 1996, 2000, 2003) of the external technology sourcing process, which goes much beyond a simple search and transfer model (Hansen, 1999; Hansen et al., 2005). More precisely, the technology scouting process seems to encompass a number of stages scouting units pursue in order to search both for external solutions but also for internal requirements; assess the opportunities to transfer external technologies but also translate and match them to specific areas within the firm; and finally try to "sell" to other units within the company that those opportunities should be acted upon.

Figure 4-2 below depicts the distinct stages that emerged from my data and contrast them with the conventional search-transfer model (Figure 4-1). In the sections that follow, I elaborate on each of those stages.

Figure 4-1: Conventional Search-Transfer Model in Knowledge Transfers

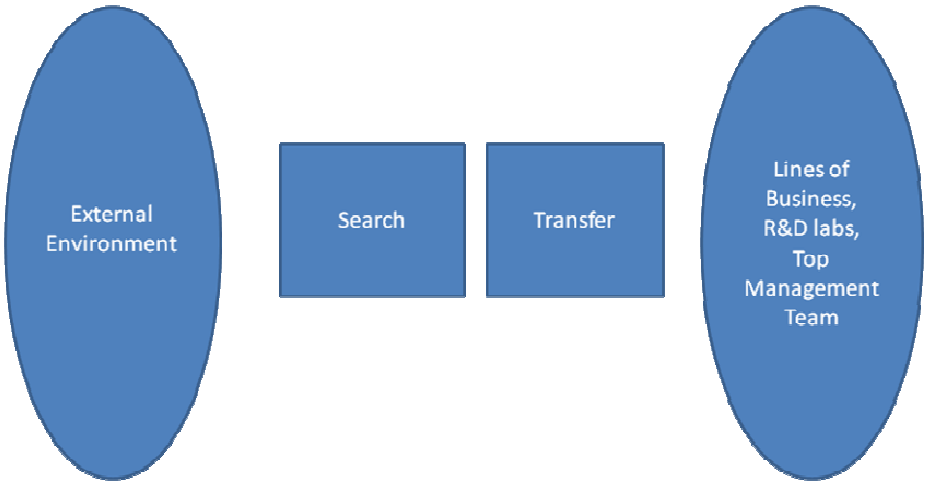
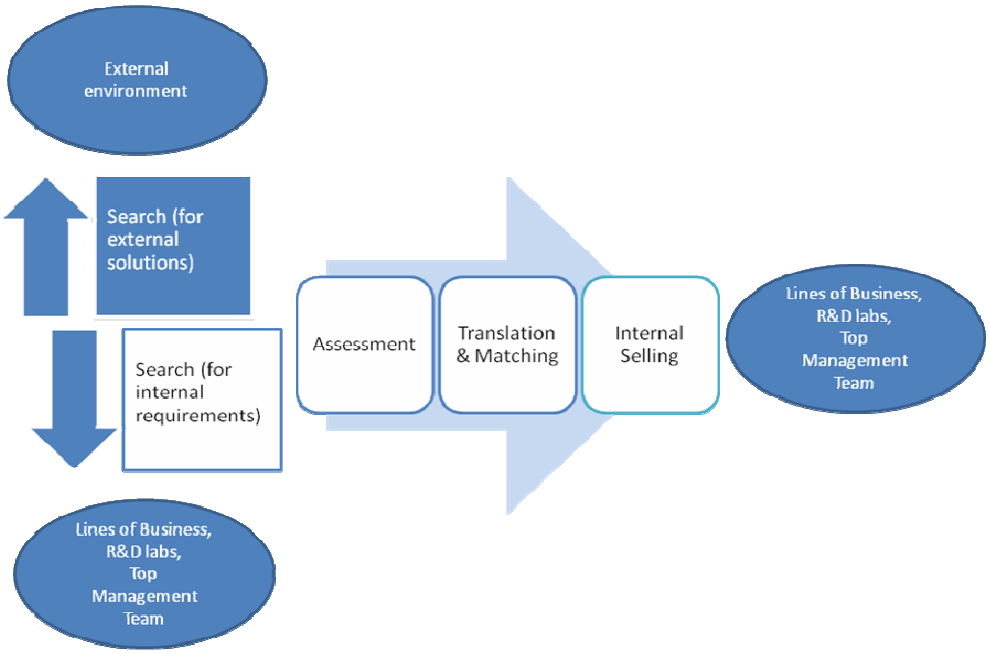


Figure 4-2: Emergent Model of the Technology Scouting Process



4.1. EXTERNAL AND INTERNAL SEARCH

Not surprisingly my data confirmed that a key stage in the technology scouting process is the search for external technologies in the environment. My data indicate that the Silicon Valley team had some touch point with (not necessarily a physical meeting) between 800 and 1200 companies per year, in the period between January 2003 and December 2005. These were often companies that sent them a business plan, or that they met at conferences or through a venture capitalist. Out of those 800-1200 companies, Europ Telco's managers in Palo Alto made approximately 200-250 sit down visits per year.

More interesting though was the specific way Europ Telco managed to access the local start-up companies when the scouting unit was established. My corporate interviewees revealed that it was always clear to them that having a physical presence in Silicon Valley would not mean that Europ Telco's scouters would be able to automatically access new technologies developed in the area. In fact, when Europ Telco established its unit in Palo Alto in 2000, it also created a stand-alone venture fund designed to gain early insight into emerging business models and technologies. In those early days in Silicon Valley, the Europ Telco's scouters relied on venture capitalists to arrange the majority of their meetings with start-ups. A senior corporate manager explains:

> *At the beginning we invested in a couple of funds that gave us a foot in the door in this venture capital start-up market… It is a very tight-knit network of people who know each other in Silicon Valley and you have to have friends there… That's the way I bought my way into this, by participating in those funds; they were well*

known in the Valley and very well connected and they helped us open the doors to a number of other people…

After a couple of years in Silicon Valley and influenced by the burst of the venture capital bubble, though, Europ Telco decided to focus on technology scouting and not to make any further investment in new funds. By then, however, Europ Telco scouting unit in Silicon Valley had already built a network of partners and it was able to attract many start-ups directly, although the relationship with VCs remained a key source of leads. One of the VP's working in the scouting unit in Silicon Valley explained:

I was with one of them [VC], on Friday, for instance, and what I do is a portfolio review, I look at their portfolios, what they have invested in recently, what they have as the next target, tell them how I see the market and what I would like to see for these start ups. That is a mutually beneficial exchange because they tell us a summary of what they have seen and I tell them a summary of the customer requirements for the portfolio in exchange. So I do this on a regular basis, with about 20-25 VCs…

The scouters in China and Japan, on the other hand, in the absence of an equally active VC community, reported the importance of using their own personal networks and following internal leads to establish relationships directly with the sources of the external technologies, which meant that they were scouting much less technologies than the scouting unit in Silicon Valley[13].

[13] As explained above, the data about the activities of the scouting units in China and Japan come exclusively from my interviews and field observations. I could not triangulate these data with the Rock database for those units given the time period of the entries in my sample, which preceded the opening of the scouting units in China and Japan.

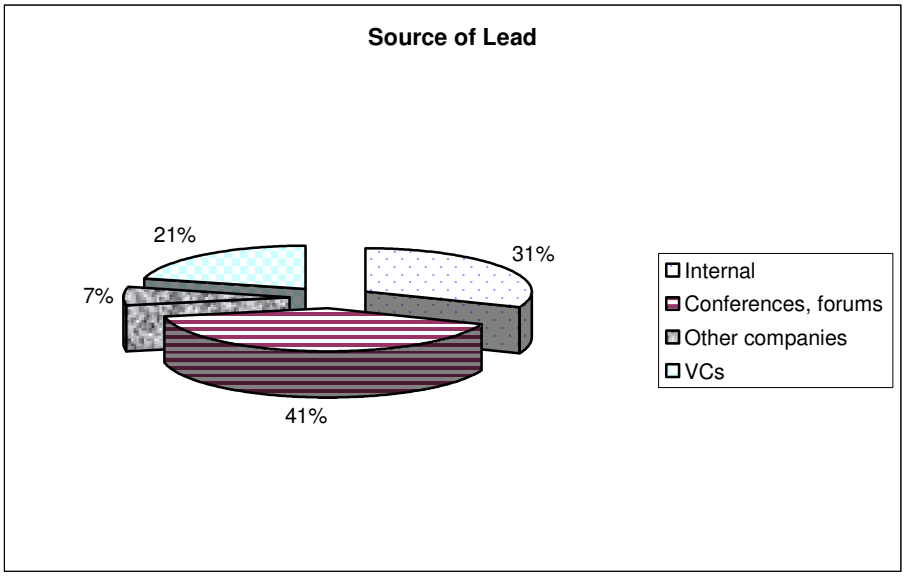
Europ Telco scouters in all scouting units also participated actively in a number of conferences both as attendees and speakers. A large number of external technologies were identified in those fora. More precisely, managers of Europ Telco's scouting unit in Silicon Valley presented, on average, in 15 conferences per year, mostly represented by the unit's head. They also attended 20 other conferences per year, on average. On top of that, Europ Telco established, in partnership with other telecommunication companies a "Service Providers Forum", a monthly meeting of representatives from wireless and wireline carriers' corporate venturing and R&D divisions in Silicon Valley. Usually, three start-ups presented at each of those meetings. Finally, Europ Telco scouters frequently received leads about external technologies from other areas within the Europ Telco. As one of the scouters describe:

> *A company like Europ Telco that has thousands of employees gets quite a few touch points with new companies wanting to do business with us. And our scouting units get a fair number of leads originated internally, sometimes they come directly from the chairman, sometimes they come from the CEO, sometimes they come from one of the heads of the lines of business (…) There's always a bit of a deal flow that's coming from the top of the company, but the nice thing is that there is also a deal flow of things coming from down the line in the company… These are middle managers that have heard of a company, or a company has contacted them and now they want us to have a look at it…*

Figure 4.3 below depicts the percentages of external technologies analysed by Europ Telco's scouting units, broken down by the source of the lead.[14]

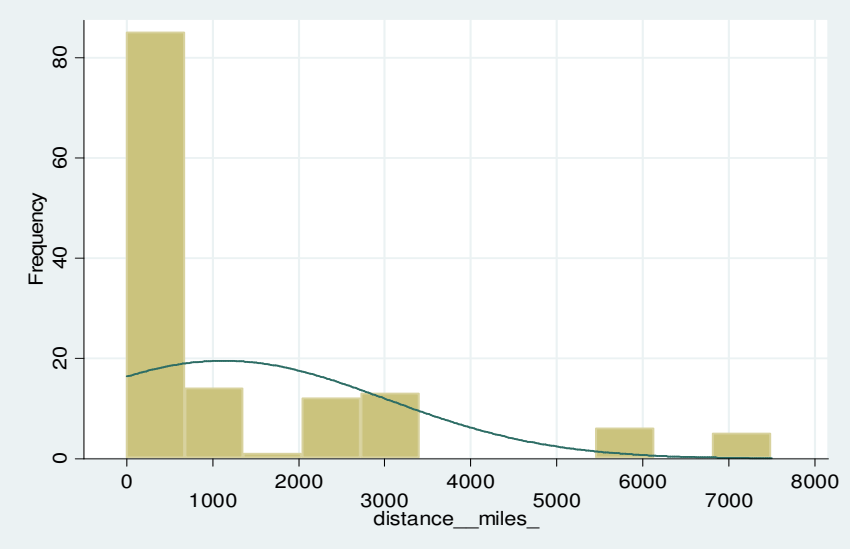
[14] The source for this figure is the Rock database. As I describe below, it only includes those external technologies about which the scouting units wrote a transfer memo. It is plausible that the relative proportion of internal leads may

Figure 4-3: Source of the Leads Pursued by Europ Telco's Scouting Units



In geographic terms, the histogram below shows the distribution of the sources of the external technologies in relation to their geographic distance to Palo Alto, California. More precisely, the 25th percentile=10 miles; the 50th percentile=34 miles and the 75th percentile=2910 miles.

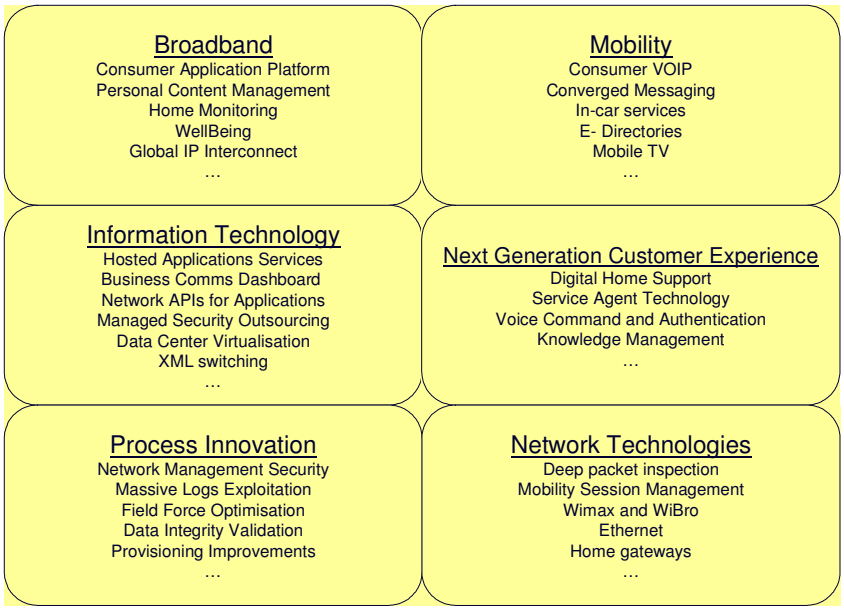
Figure 4-4: Histogram of Geographic Distance



be inflated in this figure because scouters are probably more likely to write transfer memos for those external technologies which lead was originated internally. In any case, this figure provides a reasonably precise description of

The Head of Europ Telco scouting units usually agreed, on a yearly basis, with Europ Telco's research labs and lines of business on a number of technological areas they would be scouting. In 2005, it included broadband, mobility, information technology, next generation customer experience, process innovation and network technologies. In addition to those broad areas, it was also available to scouters a number of specific solutions/technologies within each broad technological area. For instance, within the area "Mobility", Europ Telco was particularly interested in consumer voice over internet protocol, converged messaging, in-car services, e-directories and mobile TV. See Figure 4.5 below. Table 4.2 indicates that in the period of 2003-2005, the technology scouting unit in Silicon Valley actually accessed external sources in 73 different Venture Economics Industry Codes.[15]

Figure 4-5: Technological Areas Scouted by Europ Telco in 2005



the source of the leads the scouters followed between January 2003 and December 2005.

[15] It is very likely that Europ Telco's scouting units have had touch points with firms in other industries. Here again my source is the Rock database so it only includes technologies about which the scouting units wrote a transfer memo.

Table 4-1: Industries Scouted by Europ Telco - Venture Economics Industry Codes (VEIC)

VEIC Code	Description
1120	CATV&Pay TV Systems
1130	Radio & TV Broadcasting & Other related equipment
1135	Services to Commercial Communications
1220	Telephone Interconnect&Other equipment
1299	Other telephone related
1300	Wireless communication
1310	Mobile communications, pagers & cellular radio
1320	Wireless communication services
1330	Wireless communication components
1399	Other wireless communication
1510	Local Area Networks
1515	Wide Area Networks
1520	Data communications components
1521	Communication Processors/Network Management
1525	Switches/Hubs/Routers/Gateways/ATM
1550	Internet Communication and Infrastructure NEC
1552	Internet Multimedia Services
1553	Internet Backbone Infrastructure
1561	Internet Security and Transaction Services
1563	Ecommerce enabling software
1899	Other communciations products (not yet classified)
2126	Handheld computing (PDA)
2141	servers
2295	Digital Imaging Services
2311	Business and Office
2322	Communications Products/Services
2399	Other integrated systems and solutions
2660	Data processing, analysis and input services
2675	Computer security services
2691	Data communication systems management
2710	Systems software
2711	Database & File Management
2713	other systems software
2720	Communications/Networking Software
2721	Security/Firewalls, encryption software
2724	Multimedia software
2729	Other communications/Networking software
2731	Business and Office Software
2748	other industry specific software
2749	Other applicatoins Software
2768	Other internet software services
2780	Internet Systems Software
2783	Webserver software
2784	Web Languages
2798	Other internet systems software
2800	Internet and Online Related
2818	Recreation/Entertainment/Music/Movies
2841	Computer related services
2850	web aggregation, portal sites, exchanges
2911	Voice Recognition
3110	Semiconductors
3112	Standard Semiconductors
5350	Medical Monitoring Equipment
7160	TVs, Radio, Stereo Equipment&Consumer Electronics
8240	Robotics
9320	Advertising and Public Relations
9350	Consulting Services

On the surface, one may infer that the existence of this list (Figure 4.5) with the specific technological areas Europ Telco was interested in would provide the necessary orientation for the scouters to search the external environment. My interviews indicate, however, that the formal definition of those technological areas was far from enough to allow scouters to do their jobs. Instead, scouters spent a lot of effort searching within the firm, trying to make sense of what they really should be looking for in the external environment. More precisely, the Head of Europ Telco's scouting units estimated that scouters spent as much time on external search as on internal search[16].

Therefore, using my informants' verbiage "being connected with other firms in Silicon Valley, China or Japan was only one half of the story". The other half was to understand on a permanent basis where Europ Telco was going to and how they could keep connections back in Europe that could maintain them constantly informed about the firm's needs and priorities. This internal search was not a one-off task though. Rather, it was an ongoing activity that required a lot of time of the scouting units' managers and that was done in parallel to the external search. In fact, the Senior Vice President responsible for all scouting units, a very experienced manager who had worked for ten years at Europ Telco's before being assigned to Silicon Valley (please refer back to Appendix 4), used to go back to the Europ Telco's headquarters in Europe about once every two months for a week, which was a significant investment of his time. He normally scheduled anywhere between 15-20 meetings in that week. His estimates were that half of those meetings was collecting information about the company's priorities. He usually met heads of division, CEOs of division, product managers, and research people:

[16] More precise estimates of the time spent in external and internal search, as well as the impact of those efforts on the likelihood of a successful initiation, will be provided in the quantitative study (Chapters 5-7).

They tell me what has changed in terms of the company's priorities because that is the most important thing, having your radar in such a way so the technologies you identify around the world are really useful as opposed to "a nice to have"... But it is hard to know what the "patient" [lines of business] really suffers from… Is the problem really that they need new stuff, is it a channel problem, is it a product problem, is it a process problem? I go to the operational divisions and I say: "tell me where you have real problems, which technology could solve" but extracting that "book of pain points" takes a long time, multiple interviews with the lines of business and drilling through questions like that… Those pain points have never been written anywhere…

My interviews with the managers in the lines of business also provided some insight into this question. As the Director of Technology Development of one of Europ Telco's lines of business explained:

They [scouters] are not here in my day-to-day operation, it is very hard for them to know what exactly my proposition and product teams are doing (…) They need to invest a lot of time so they can understand my roadmap. But I really think that even more important than understanding my requirements is to understand my constraints, i.e., what I cannot do…

In sum, I observed a double-ended process, not just traditional external search but a two-way search. Surprisingly, a major challenge for the scouters was not identifying and gaining access to relevant external knowledge (the usual definition of "external

knowledge sourcing") but having a profound understanding of Europ Telco's needs (and constraints).

4.2. ASSESSMENT, TRANSLATION AND MATCHING

Assessment

Scouters evaluated the opportunities to transfer external technologies at two points: first after they had their first contact with an external company they had to decide whether or not to have a (typically 90-minute) formal meeting at the external company's premises. They usually met with approximately 20% of the companies they had some touch point with. As I indicated above, they had on average 200 formal meetings per year. And, only one in each four companies the scouters met was considered potentially useful for some unit with Europ Telco. More precisely, while they met face-to-face with 200 companies per year, only approximately 50 of them passed their initial assessment.

My interviews and access to internal materials indicated that the scouters' assessment of external technologies was centred on the following areas. Firstly, they assessed the *external technology* itself, trying to answer fundamental questions such as "is it significantly different to the status quo?"; "is it believable?" Secondly, their assessment focused on the *market* for that external technology, trying to understand whether there was a credible market in general; a target market in Europ Telco's customer base; what were the barriers to enter in that market and whether that external technology was bound to cannibalise existing services provided by Europ Telco. Thirdly, scouters assessed the *source* of (i.e. the company producing) the external technology identifying its stage in the product development cycle (e.g. pre-product; early trials; late trials; general release); whether it had enough financial backing; who are their customers and partners.

All this assessment was mostly done by the scouters who reported the impossibility of keeping recurring to Europ Telco's lines of business to evaluate the external technologies they identify on their behalf. The quote below describes how the technology scouters deal with this challenge:

> *Sometimes I consulted my research guys back in my labs in Europe… I could always find someone who knows everything about a determined technology, that's all they've done in their life and they read papers about it, publications about it … I use them in that case, by asking them to confirm what I think about a specific external technology. Alternatively, I could call any of my VC partners and they are likely to know at least one company in their portfolio that is working in the same technological domain. I then call the company suggested by the VCs and they usually know their competitors. This generates a list of five or six companies working in the same technological space which provides us with a good idea of how the company I saw stands vis-à-vis its competitors.*

Most of the screening of the external technologies is done by the scouters without recourse to the final user. In other words, the more scouters knew about the lines of business' needs, the more they felt they were able to select the external technologies that really mattered to end users within Europ Telco. As I discuss below, however, the external technologies that passed the scouters' assessment were those that scouters believed there was an opportunity to transfer external knowledge. The scouters were not able, however, to impose their assessment on any unit. Therefore, finding hundreds of external technologies and screening them was far from all the scouters had to do. Still,

they had to find a way of making someone else within Europ Telco "see what they were seeing". One scouter in Japan noted:

> *"I feel I am a hunting dog in the forest but I need someone with a gun to shoot the prey… I need to get some action from the lines of business."*

Translation

In order to generate internal interest, scouters had to make those selected external technologies easily comprehensible to managers within Europ Telco. Therefore, for those few selected companies (on average 50 per year), scouters completed a form, called "transfer memo", where they codified their knowledge about that specific external technology and its source. The transfer memo is a standardised form with 26 fields (please refer back to Table 3.2), many of them to be completed with knowledge that could be easily codified, such as company and product name; market; competitors; customers; age and size (in terms of number of employees) of the external source; its financing, headquarters and other locations, contact name. More importantly though were a few fields—namely product details and comments/assessment—where scouters had to codify their knowledge about the opportunity to transfer that external technology and its relevance to Europ Telco.

The information scouters have obtained in their internal search played a pivotal role. My interviews coupled with the analysis of the transfer memos indicate that the scouters' task consisted of basically two elements: the first one is a short description of the internal capabilities and demands in relation to that specific technological domain. Scouters typically started by describing the existing demand at Europ Telco in order to convince the recipient unit that they understand what their current status on that

technology was. The second part was to articulate succinctly how the external technology related to that specific demand. One of Europ Telco's scouters described:

> *Most companies I see have a "shotgun proposition"… They have a deck of slides designed to get them funding, in which they say they can do too many things… That's absolutely no use, if that deck is presented to Europ Telco. I've got to really help them [the entrepreneurs] focus down to the sharp end of the needle, the one area of their proposition that is very clearly aligned with Europ Telco's problem set. I actually find that in order to get Europ Telco interested in the technology of a new company, the last thing you do is simply send the company's technology description to my units in Europe. Instead, I need to do the articulation of the idea to my people in Europe whereby I absolutely put it in the language the Europ Telco people will understand…*

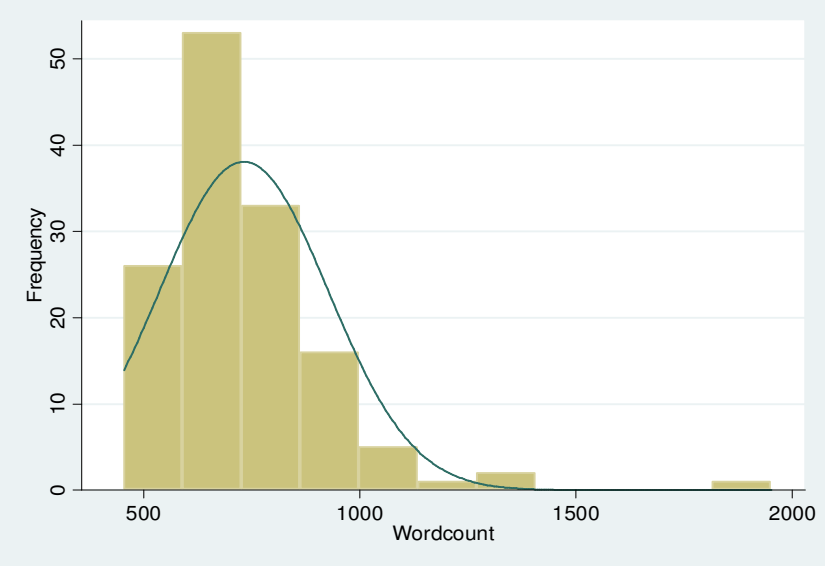
An equally important aspect was to make this description as succinct and precise as possible. As another scouter describes:

> *There are teams of people within Europ Telco who could write thirty page reports on any of those external technologies… There are some very, very bright people who work on an in-depth analysis, in-depth report. My team doesn't do that. I do is quick half-day, one-day analyses.*

Informants very often used the term "translation" to describe what they do when completing those fields of the transfer memo. They even used the verb "ET'ise" the external technology (in a reference to the company initials) to explain what they do in this

stage. Tables 4.3 and 4.4 below provide data both from interviews and from the Rock database entries evidencing the scouters' translation effort.[17] As Figure 4.6 depicts, the 137 transfer memos in my sample ranged from 455 words (approximately 1 page) to 1952 words (approximately 4 pages).

Figure 4-6: Histogram of the Transfer Memos Word Count



[17] These are as close as possible to verbatim transcriptions of the Rock database entries. In order to preserve confidentiality, however, I had to make some minimal changes in company and technology names

Table 4-2: Translation – Short Description of Europ Telco's Internal Capabilities and Demands

Translation	Excerpts from the Transfer-Memos	Company
1. Description of the existing internal technological capabilities and demands	As services offered by Europ Telco increase in number and complexity, there is a need to provide an improved level of support that encourages take-up and reduces churn, whilst incurring minimal support costs	Tech Charla
	We need to be able to provide real time Dashboard views of enterprise wide events	Tech Ogic
Representative quotes	Europ Telco should be offering more value added Broadband services (targeted at the Small and Medium Enterprise Segment)	Tech Dyna
This is "what the patient really suffers from"	We need new solutions as we are getting into the new and exciting area of Home Networking	Tech Soft
We need to show our understanding of the firm's real problems, which external technologies could solve	In our Managed Desktop services, we need to reduce costs and have a better control of licences as well as have a better visibility of who is using applications and for how long	Tech Blue
That's the book of pain points	We need to provide more converged services	Tech Pita
We show we understand Europ Telco's technological needs	We have to migrate customers to the new Berner Platform	Tech Bom
	Our existing Interactive Voice Response (IVR) systems are not popular with customers	Tech Charla
	Europ Telco already has forensic (after the fact) services but we are not prepared to offer real time Dashboard views	Tech Ogic
	Our existing soft VPN (Virtual Private Networks) products only go end point to gateway	Tech Dynamo
	We cannot reach new demographics with our Europ Telco's ETO2 Plus Communicator	Tech Pita
	We have to find alternatives to our Identity Management needs.	Tech Centre

Table 4-3: Translation - Articulation of the relevance to Europ Telco

2. Succint description (using the Europ Telco's "own language") of how the external technology can help	This technology allows a much richer interaction for our customers whilst offering Europ Telco the ability to significantly reduce the calls reached the customer help-desk/call centre.	Tech Charla
	Their ability to capture and store the logs (for archiving and Compliance) makes them different from any similar solution the scouting team has seen. The breadth of the application of their approach is attractive to us as it is not just around data	Tech Ogic
Representative quotes	They offer a tool for rapid set up and tear down, low cost implementation of Virtual Private Networks (VPN),compared with the truck roll and trained set up of other VPN technologies which can be very attractive to our SME segment	Tech Dynamo
… we do the articulation of the idea to our people in Europe whereby we absolutely put it in the language the Europ Telco people will understand…	They started with Sweet Home (their first partner in home networking) where the scale (6.5m subscribers) brought out the real sensitive and business issues. Tech Soft actually went in and listened to support calls that were coming in to gain a good perspective	Tech Soft
….focus down to the sharp end of the needle, the one area of their [external technology] proposition that is very clearly aligned with Europ Telco's problem set.	With this technology, Europ Telco's Managed Desktop users could go to an "applications portal" where all the applications they are allowed to see are listed. They click on the one they want and the application (or the main part of it) gets downloaded. It	Tech Blue
Our process is very manual, it is customised every time we write about a technology. We don't do generic descriptions	This targets a different demographic. These two [Europ Telco's existing technology and Tech Pita] could be baked together and, coupled with the mobile angle, could be used to provide a unique convergence bridge.	Tech Pita
	This technology is especially useful for migrating customers from our legacy ABCD12 and GB121 environments to the new Berner platform at timing of our choice and with no user intervention	Tech Bom
	network infrastructure, security and management systems. This can help us with the new VoWiFi (Voice Over Wireless Fidelity) product set up	Tech Visto
	Could be used to extend the Service Bundle ATC and ultimately as a Process Improvement mechanism/initiative (i.e. an easy extension to apply to Telco service management)	Tech Ramtso
	Tech Hub represents a potential solution for the Hosted B2B Value added Services	Tech Hub
	This enables us to sell (self install) video services to customers and avoid the need to load us with the cost of in house wiring (i.e. negating physical link to a PSTN outlet behind the TV/STB). Also this can be used for Video in WiFi Public	Tech Visao

My informants highlighted, though, that given their relatively short length, the memos did not contain a detailed description of the external technology that would allow the recipient unit to do any in-depth analysis. Rather, the purpose of the memos was to provide a very relevant, precise assessment of an opportunity to transfer an external technology in such a way that the recipient unit could understand the nature of the opportunity and be interested in following-up on it. The transfer memos were not an end in themselves but just the first step in connecting the dots between the external source and a specific unit within Europ Telco.[18] A follow-up from the recipient unit was a *sine qua non* condition for the continuity of the sourcing process.

Matching

Assessment and translation, however, were not the only tasks performed by the scouters before they were able to send out the transfer memo. My interviewees reported that when they were writing the transfer memo they were particularly concerned about indicating to which specific areas within Europ Telco's lines of business a focal external technology was relevant.

In a large corporation like Europ Telco, scouters assessed that it was important to be able to connect the opportunity to transfer an external technology to specific people or teams of people within the company.

More precisely, scouters considered the "Relevance" field of the transfer memo, one of the most important parts of their memo, as they believe the right matching was crucial in generating any action from the lines of business in Europe. The analysis of the Rock entries reveals that four types of matching were present: 1. matching to a single area/team but without mentioning any specific manager; 2. matching to a specific

[18] It should be clear thus that the transfer memos are qualitatively different from reports that an environmental scanning unit usually provides the strategic planning area with.

area/team and to a specific manager; 3. matching to multiple areas/teams (but without mentioning specific managers) and 4. matching to multiple areas including the names of multiple managers. Table 6 contains data from the transfer memos illustrating those four types of matching.

Table 4-4: Matching

Matching to	Excerpts from Transfer Memos	Company
1. A Single Area/Team	This is relevant to our Infrastructure solutions area	Tech Bright
	This is highly relevant to our team that manages the Operations Platform service,	Tech Visto
	Highly pertinent to our ICT ambitions around the “XTC” Focus Area	Tech V2S
2. Multiple Areas/Teams	Their business solution could be used by our Global Business operations area… The videophone solution could be used by our Retail area for their video phone services.	Tech Bom
	Tech Leblon is highly relevant to Premises, Premises Gateway, Local Access, Aggregation, Access & Backhaul domains of new network initiative. It should also be considered for the recent Wholesale Access Aggregator RFI (Request for Information)	Tech Leblon
	This is relevant to Authentication capability of our “Next Decade” Initiative (particularly Uno SignOn aspects) and therefore Customer Portal capability. Also Storage domain “Next Decade” Initiative.	Tech Lagoa
	Looks to be a very good map to our "ETP" 2020 Capability project.	Tech Xell
3. A Single Area/Team and Manager	A potential addition to the Managed Desktop portfolio (Nigel Jones)	Tech APP
	This is particularly relevant to the new road map of our fixed-mobile converge team (Barbara Schapira).	Tech Pita
	It could be used by our team (Hans Klein group) responsible for in home distribution of content	Tech Visao
	Andre Fogatt from our Mobility division should check the fit with his area’s initiative on IMS and Mobile Virtual Network Operator (MVNO).	Tech Movil
4. Multiple Areas/Teams and Managers	This is relevant to John Smith's area as they have recently met with one of Tech Sure's competitors… Also relevant to Peter Jones who is on the look out for Security Dashboard products.	Tech Sure
	It is very relevant to a number of our areas: 1. the server consolidation activity (Jim Heskins); also applicable to Europ Telco Infrastructure Utility (server) component (Kannan Pirjal); as Managed Server solution (ICT DataCentre portfolio)	Tech Log

4.3. INTERNAL SELLING

The five phases described above (internal and external search, assessment, translation and matching) provide another angle on what has been commonly described in the literature as the search stage of external knowledge sourcing.

The last stage of the technology scouting process is thus the moment scouters share their transfer memos with other units within Europ Telco. Both my interviews and (mainly) the examination of the Rock entries show that in fact it is not the external technology that is being transferred. Rather the content of the transfer memo is the scouting unit's knowledge about that technology, its source and the scouters' judgment about the relevance of that external technology to Europ Telco. In other words, it is clear that what is transferred is the scouting unit's knowledge about the opportunity to transfer an external technology, not the technology per se. Thus, the main benefit for the recipient unit is to receive an assessment of an opportunity to transfer an external technology and its relevance to such unit. But, in order to obtain an in-depth understanding of the external technology the recipient does need to follow-up on the transfer-memo.

In fact, getting some action on those transfer memos is a necessary condition for the existence of a scouting unit and for the success of the external technology sourcing process as a whole. In other words, managing to get the recipient unit interested in an opportunity to transfer an external technology is practically a question of survival for the scouting unit, which does not seem to be the case for units normally involved in intra- or inter knowledge transfers the firm. Unlike operational subsidiaries, the external technologies that scouting units access are not for their own use. Thus, if they do not manage to get some action from the other units within the firm that could take advantage of the opportunity to transfer a specific external technology, the scouting unit's previous activities are virtually of no use.

And, although as full-time employees of Europ Telco they did not have a substantial variable pay (i.e. bonuses), the main indicator of the scouting unit performance was the "potential innovation dividends" of those external technologies that the lines of business decide to adopt[19]. As the VP, Strategy & Business Development of one of Europ Telco's lines of business insightfully put it:

> *They [scouters] don't have a route to market and they don't have the mandate to transfer what they find to other units… They do have the mandate to look for external technologies but they can't impose what they find onto anyone…*

Unsurprisingly thus, unlike most knowledge transfer instances where the unit responsible for the knowledge outflow usually do not follow-up after an unsuccessful transfer attempt, scouters reported that quite often their task was not over after the remittance of the transfer memo. Rather, they still had to follow-up with the recipient unit to generate some action. In the words of another scouter:

> *All of these people have got fifteen hours of work to do in their business day, and you've just given them the sixteenth hour. So the chasing is important, it's an unpleasant part of the job, by the way. You know, the number of times that I reply to my own sent mail, or "reply all" to my own sent mail, and say, have you had a chance to look at this? Can I have a call to discuss this please? So, like a persistent salesman, I have to try one, two, three, four, five, six times…*

[19] These potential innovation dividends aimed at capturing the benefits in terms of revenue generation and/or cost reduction that would accrue from the internalisation of a specific external technology. They were calculated in US$ according to a proprietary formula developed internally by Europ Telco. As I

Interestingly, the idea that they were "selling" internally those opportunities to transfer external technologies was widely shared among scouters. For instance, my informants' vocabulary referred most often to "sell" or to "downstream" the transfer memos, rather than transfer or communicate with the lines of business. Another example is that the Head of the Scouting Units, at some point, had even commissioned one of the scouters to study how CRM (Customer Relationship Management) systems could help them be more efficient in their "internal selling" activities.

Notwithstanding all their effort in internal search, translation and matching, only a fraction of the transfer memos received any action from the other units within Europ Telco. More precisely, Europ Telco's internal documents indicate that out of the all the opportunities to transfer external technologies identified from January 2003 to December 2005, only approximately 35% of them received any action from other units in Europe. In other words, out of the 137 transfer memos written in that period, in only 48 cases a line of business within Europ Telco followed up with the source of external technology.

Were some external technologies easier to get some attention from the lines of business? Or conversely, were there some properties of an external technology that made it more or less likely to be acted upon by the lines of business? When faced with those types of questions, scouters consistently pinpointed two properties of the external technologies that played a pivotal role. The first characteristic of those external technologies was what informants called "market credibility" or "market provenness". And the fact that the external technology was not new, i.e. that other firms were already using it, was not perceived as a problem but rather as a major advantage in terms of promoting a quick adoption by Europ Telco. The quote below, by ET's Senior Vice

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discuss in Chapter 6, I will use an estimate of these "potential innovation dividends" as a proxy for the motivation of the scouters and of the managers in the lines of business.

President, Technology & Innovation, summarizes the view of the managers working in the scouting units:

> *We have many ideas internally but the interesting thing about external ideas is that other people are putting money on it. And that is proof that there is a group of intelligent people somewhere ready to put their money where their mouth is and fund the company. In many instances we may have already had something similar but not in a position where it was credible enough to launch. That same idea developed externally with a whole ecosystem around it, all the large technology companies adopting or funding the idea, a number of early customers taking that idea and doing something with it is a completely different story… Now compare this with a research guy in a lab coming up with the same idea and trying to have a meeting with his boss, let alone with the head of the division, to show his idea … It is much more difficult for him to get his boss' attention because there is limited market proof around it. So the external factor brings with it a level of market credibility that helps us sell the idea internally…*

More precisely, my informants reported that, in many instances, they wrote transfer memos about an opportunity to transfer an external technology even though they were aware that Europ Telco's labs had developed similar technologies internally. The typical problem, according to my interviewees both at the scouting units and corporate headquarters, was that the lines of business did not see the commercial value and/or how a technology could be applied in specific services and the scientists in the labs did not often have the business acumen to convince them.

Similarly, scouters explained that the lines of business in Europe were very sceptical to give attention to external technologies that were still on trial or that have not been selected by other customers (preferably other telecommunication companies) yet. Therefore, it was very salient to my informants the need to show that the external technology has been proven in the market. The analysis of the Rock entries indeed shows that scouters made sure to highlight in their memos whether the external technology had 1.commercial availability; 2. a customer base and 3. financial backing. Table 4.7 below shows how scouters described the "market provenness" of specific technologies along those three dimensions.

If, on the one hand, scouters reported that opportunities to transfer proven external technologies that were more likely to be followed-up by other units with Europ Telco, on the other, my informants also indicated a strong difficulty in getting attention to opportunities to transfer external technologies that go against the "commercial or technological convictions" of the recipient unit. Some informants mentioned that some external knowledge acted as "irritants" or that some recipient units have "antibodies" to certain external technologies. And they also reported that this was not a matter of the external technology being incomprehensible to Europ Telco. In reality, Europ Telco had thousands of patents and the scouters argued that the problem was not a "lack of understanding" but a "lack of agreement".

Indeed, I linked the Rock database with patent data from the United States Patent and Trademark Office, I found out that in 98% of the cases, Europ Telco and the source of the external technology had a patent in the same technological class and in 73% of the cases in the same technological sub-class[20]. Therefore, Europ Telco's knowledge base

[20] Only in approximately 70% of the Rock entries, the external source had a patent and/or patent application. By checking Venture Expert Industry codes and visiting company websites, I could not find, however, any indication that the remaining non-patented technologies were substantially different in terms of their relatedness to Europ Telco's knowledge base.

seemed to be related to the vast majority of the external technologies described in the transfer memos.

The fact that those external technologies were technically related to Europ Telco notwithstanding, in many cases, scouters did not manage to get any action from their transfer memos if the external technology had not a good "fit" with Europ Telco's lines of business. For instance, my informants reported that very often the source of the external technology and Europ Telco both had technical competence in a determined technical area (e.g. consumer VoIP—voice over internet protocol) but their views about the commercialisation of that technology were totally different. In other cases, they referred to the lack of fit between the external technology and the "beliefs" or "vision" for the lines of business had for that technological domain.

More precisely, Table 4-6 below shows how my informants described the importance of "fit" to the likelihood of opportunities being acted upon. Inspecting the sources of the quotes in Table 4-6, it becomes clear that the idea of fit was shared both by the scouters and the managers in the lines of business and fit encompassed not only a business/commercial fit but also a more generic notion of alignment in terms of the unit's vision or beliefs about a certain technology.

In the following section, I discuss the emergent findings above and elaborate on their implications to theory and practice.

Table 4-5: Market Provenness

Dimensions of Market "Proveness"	Excerpts from the Transfer Memos	Company
1.Technology commercially available (or not)	Version 4.2 of their technology shipping for 2 years already	Tech Charla
	Moved from Version 2.0 to 2.1 last semester	Tech Bom
	Commercially available since Q3 2004 (Kir Tech).	Tech Kir
	Tech Assat is currently shipping Colbet version 2.0	Tech Assat
	(Still in Beta tests)	Tech Touch
	(No product available in the market… Just some early (Research) evaluations are in place)	Tech Sete
	(Only prototype/beta versions)	Tech Rio
	(No production yet. Prototype and beta versions of the product available).	Tech Juca
2. Customers are buying the technology (or not)	The fact that Consulting Company McCarthy themselves have used Tech Ark in 9 customer engagements, ahead of their own products, suggests Tech Ark has a very credible offering	Tech Ark
	A pretty proven company with an impressive customer list	Tech Blue
	They boast 7 out of top 8 broadband players (cable and DSL) in USA as customers	Tech Soft
	An example of their technology being used is USTelco's AskUSTelco ASA.	Tech Lium
	Fairly mature start-up with significant customer base and worldwide deployment	Tech Log
	They have just a major deal in Europe (believed to be with PSP Telco) to be announced soon	Tech Charla
	They're less than a year old, but already have a large number of customers	Tech Dyanmo
	Came across as a proven, experienced outfit with a substantial customer and deployed base	Tech V2S
	Ox Telecom uses them for their voice portal services including voice access to ringtone downloads and inteligent dialtone	Tech Movil
	Small but growing customer base	Tech Pita
	Their technology is being used at PP Telecom	Tech Rad
	Tech Ogic now has 20K end users - mostly added in past 12 months.	Tech Ogic
	(No customers, no revenue)	Tech Urca
	(They only have unamed trialists)	Tech Ponte
3. Financial backing (or lack of)	Company supported by leading investors with proven track records for success. Since its inception, the company has secured over $24 million in financing.	Tech Overt
	The company has raised $77 million in private equity financing from Innovacom (France Telecom), Mitsubishi International Corporation, and other strategic private investors.	Tech Leblon
	Funded by Draper Fisher Jurvetson (DFJ), Geneva Venture Partners and a number of experienced Silicon Valley angel investors.	Tech Hub
	Tech Ark has raised $29m last year	Tech Ark
	Intel DSL unit, Cisco, 3 U.S. Telcos investing in this company	Tech Soft
	Motorola holds 20% of their capital	Tech Movil
	(We had no evidence of who is investing in this company)	Tech Sampa
	(Self financed plus loans, they refused term sheets from VCs).	Tech Raio
	(Pre-revenue. Will they manage to receive Angel investing and first institutional round by second tier VCs?)	Tech Urca
	(Privately held yet to secure any VC funding)	Tech Sete
	(Young start-up (based out of a single floor of a Victorian house), no funding)	Tech Minas
	(Early stage (pre first round). Privately owned by team. Starting to look for investment)	Tech Bahia

Table 4-6: Knowledge Dissonance

Knowledge Dissonance	Representative Quotes
1. Business/commercial fit	It is hard to gauge interest when the external solution goes against what we already use (Business Management Director)
	It is very hard to get them [lines of business] to do something about it [the external technology] when it doesn't fit in with their current model. Even though it's an innovative technology, if it doesn't fit with their current model of what should be done in that technological domain, there won't be a follow-up... (VP, Technology & Innovation)
	… it has to fit our particular way of commercializing this type of technology (Account Director)
	Whenever you come up with something new, first people try to see if it fits with their business as usual (Director Global Scouting)
	Is this something that will fit in our product roadmap? If not, it is not going to happen (Director, Value Added Services)
	Does this fit with how ET or a service provider traditionally does business, or will do business in the future? For example, the technologies that support a model where the start-ups are going to be the interface for the customer won't entice the attention of our lines of business (VP, Business Development)
2. Fit with existing vision/ beliefs/thinking	This [external technology] fits with much of their [lines of business'] current thinking regarding a specific domain (e.g. technologies enabling the management of personal content) (Senior Vice President, Technology)
	So their [managers in the lines of business] disadvantage is that they're in a box… they usually are very good and know a lot about their "box" but if it [external technology] contradicts what they believe, they don't want to know about it (VP, Technology)
	Sometimes our managers are very difficult to convince because they usually know a lot about a specific technology and they always have something to say about it. Very often if the external technology doesn't build on the technology they have already chosen, nothing will happen (Director, Market Developments)
	If managers in the line of business say "yes, there is a really good fit with our vision for this techonological domain" they will come back to us… if they don't see that fit, they simply ignore our memos (VP Technology)
	They [managers in the lines of business] have anti-bodies to technologies that contradict their convictions (Director, Research & Venturing)
	There is not a lot of receptivity to technologies if they don't fit the vision of the existing lines of business… Maybe we should create a new line of business but that's a very hard sell in the company (Director, Global Scouting Operations).

4.4. DISCUSSION

4.4.1. Navigating the Internal Maze

External search has traditionally been the facet of external knowledge sourcing that received more scholarly attention. Ever since the early studies on environmental scanning units (e.g. Aguilar, 1967; Diffenbach, 1983; Ghoshal, 1985; Lenz and Engledow, 1986; Stubbart, 1982) the central focus has been on how "to gather pertinent environmental information" (Lenz and Engledow, 1986:69). In other words, environmental scanning was fundamentally concerned with monitoring the *external* environmental. Although the more recent literature on external knowledge sourcing is not primarily concerned with the monitoring per se but with the internalisation of external knowledge (be it through R&D agreements, alliances, contracting, equity investment, etc.), it remains focused on how to *access* the external knowledge or how to be open to external innovation (e.g. Ahuja, 2000; Chesbrough 2003a; Katila and Ahuja, 2002; Laursen and Salter, 2006; Rosenkopf and Nerkar, 2001).

My findings did confirm the *external* challenges to managers involved in technology scouting notably in the initial years after the scouting unit was established. More precisely, my data provide a clear illustration of how Europ Telco's corporate managers dealt with the Silicon Valley scouting unit's liability of newness (e.g. Freeman, Carroll and Hannan, 1983) and foreignness (e.g. Zaheer, 1995) by bringing financial resources to the table and thus partnering with high status local VCs which enabled Europ Telco's managers to tap into the tight knit network in Silicon Valley.

More interestingly though my data reveal a much less studied facet of the external knowledge sourcing process and its implications for knowledge stickiness (Szulanski, 1996, 2000, 2003). My informants highlighted the difficulties in *internal* scouting and

saw those activities (internal vs. external search) as two very distinct phases in the technology scouting process.

I believe that by analytically separating those two phases of the scouting process, we can better understand (and explain) possible causes for initiation stickiness (Szulanski, 1996, 2000, 2003). Szulanski's (1996, 2000, 2003) view of initiation stickiness seems to implicitly assume that the difficulty in recognizing opportunities to transfer is due to the difficulties in "finding" the opportunity. By disentangling internal search from external search, my data seem to indicate that scouters may find it even more difficult to make sense about what they should be looking for rather than "finding" the external technology once they have learned how "to position their radars". The managers in the Silicon Valley scouting unit liked to use the "doctor-patient" analogy to describe their job. They usually highlighted that "finding the medicine outside" (i.e. identifying an external technology that would solve one of the company's problem) was no more challenging than accurately "identifying which illness the patient suffers from" (i.e. finding out Europ Telco's technological needs). For the managers in the lines of business, disclosing their technological needs also meant letting other areas know their weaknesses and constraints, which was not something they were prepared to do voluntarily. For instance, as some of my informants in the lines of business reported, the most difficult part for them is not tell what they would like to have but "what they cannot do". Thus, scouters had to constantly navigate in internal maze trying to extract that "book of pain points" from the lines of business and make sense of what they should be looking for in the external environment.

But once they left their own organisation and found in the external environment a potential opportunity to transfer an external technology that could be connected to an internal requirement, they had to once more carefully navigate in the internal maze and make sure the external technology find its way to the right recipient. More precisely,

external technologies might solve Europ Telco's problems but only if connections between existing external solutions and internal problems can be made across the boundaries between them (Hargadon and Sutton, 1997). In that regard, Europ Telco's managers working at the scouting units are more than scouters in the sense that they do much more than "reconnoitring the external environment for the purpose of making discoveries or acquiring information". They are clearly brokers to the extent that they "facilitate transactions between other actors lacking access to or trust in one another" (Marsden, 1982:202).

It is important to note however that their brokerage function implies not merely them acting as agents, negotiators or middlemen. Rather, knowledge brokers here, as well as in Brown and Duguid (1991, 1998), are fundamental in their role of manipulating the external knowledge (e.g. Pawlowski and Robey, 2004) before transferring it to other units within Europ Telco. As described in the communities of practice literature (e.g. Brown and Duguid, 1991; Pawlowski and Robey, 2004; Wenger, 1998), this process of translation seems to involve framing the elements of one community's world view (e.g. Silicon Valley-VC-Start-up) in terms of another community's world view (incumbent large European telco).

Closely related to this translation is the process of matching the external solution to specific internal needs. Translation allows the external technology to be understood within the specific context of the focal firm. It does not necessarily trigger any action from specific internal actors. It is the process of matching the external technology to a specific area, group or person that increases the likelihood of that issue being salient to them. And here again scouters act as brokers but differently from the traditional *tertius gaudens* orientation emphasized in the structural holes theory (Simmel, 1950; Burt, 1992, 2000), which consists of the advantage a broker has by playing people off against one

another for his or her own benefit. Instead, scouters here have a *tertius iungens* (Obstfeld, 2005) strategic orientation. Obstfeld (2005:102) explains that expression "tertius iungens" has its roots in the Latin verb "iungo" meaning to join, unite or connect but used in later Latin metaphorically as "to unite" or " to form" (as in a friendship). Given a specific structural hole, *tertius gaudens* takes advantage by maintaining separation among alters, whereas *tertius iungens* closes it to coordinate action which is central to the combinative activity at the root of innovation (Obstfeld, 2005)

In addition, scouters were very aware that decision makers in the lines of business experienced information overload and that their attention was a very scarce resource (Hansen and Haas, 2001). As we know from the attention-based view of the firm (e.g. Bouquet and Birkinshaw, forthcoming; Ocasio, 1997), decision makers are selective in the issues and answers they attend to at any time and that what they do depends on what issues and answers they focus their attention on (Ocasio, 1997:190). Therefore, scouters, when writing their transfer memos, were particularly careful in completing the fields "relevance description" and "comments/assessments" in an attempt to gain decision makers' positive attention (Bouquet and Birkinshaw, forthcoming).

And obtaining the recipient unit's attention is key to the success of the technology scouting process as a whole. Scouting units are a type of subsidiary with a very special mandate (Birkinshaw, 1996; Birkinshaw and Hood, 1998)—a mandate to search but not to make other units act on what they find—and if they do not manage to convince other units within the firm that there was an opportunity to transfer a determined external technology, the scouting unit's activities are virtually of no use. As my data showed scouting units have "no route to market". This highlights that initiation stickiness (Szulanski, 1996; 2000) is even more consequential here. If in most traditional cases it may prevent MNCs to reap the "incremental value of being multinational" (Kogut, 1989:

383), in the specific case of technology scouting units, initiation stickiness may threaten their own *raison d'etre.*

In sum, while significant progress has been made in terms of identifying different types of "radars" that can be used to access external knowledge—ranging from corporate venturing (e.g. Dushnitsky and Lenox, 2005; Wadhwa and Kotha, 2006) to the forming of strategic alliances (e.g. Dussauge, Garrette and Mitchell, 2000; Kale and Singh, 2007) to informal networks (e.g. Liebeskind et al., 1996)—much less scholarly attention has been devoted to examine the internal challenges organisations face in deciding how to "position" the radars and how to manipulate the "signals" the "radars" are capturing and act on them. If, on the one hand, this may be partly justified by the fact that those internal processes are rarely observable, on the other, this can be hardly attributed to the lack of relevance of such internal processes. In fact, this study has shown that it is exactly in the internal maze that efforts of sourcing external knowledge are more likely to be lost. This seems to be especially true in the case of multinational organisations revealing that their large size and global presence may be beneficial in providing *access* to more sources of external knowledge but at the same time such characteristics exacerbate the internal challenges involved in the initiation of the external knowledge process. If recent literature has already shown that in intra-firm knowledge sourcing managers have significant difficulties in identifying where valuable knowledge resides within the MNC (e.g. Denrell; Arvidsson and Zander, 2004; Monteiro et al., 2008), this study extends such argument to show that in the initiation of the external knowledge sourcing process, an equally challenging task is to identify where the "pain points" reside in the MNC.

There is also an interesting parallel between my findings and Almeida et al.'s (2003) that in many cases size is positively associated with *opportunities* to access external knowledge but negatively correlated with the motivation to use it. They argue

that larger firms, having reached higher-status positions, are likely to look for similar status partners and are less motivated to absorb regional knowledge (2003:306). My findings seem to point out to an ”ability” rather than a “motivation” explanation for the same phenomenon. In other words, I show that even when large firms purposefully establish units to access and to use this localised knowledge, they may not be able to do the latter due to initiation stickiness (Szulanski, 1996, 2000, 2003).

As international business scholars increasingly emphasize the MNC advantage in potentially *tapping* knowledge dispersed around the world (e.g. Doz et al., 2001), the findings in this study suggests that we should also take into consideration the enormous internal difficulties faced by their managers in recognising the opportunities to transfer this external knowledge and in acting thereon.

4.4.2. Market “Provenness”

As reviewed in Chapter 1 above, the extant literature has consistently shown that external knowledge sourcing has a positive effect on innovation performance. The most well-established line of thinking, building on evolutionary economics arguments (e.g. March, 1991; Nelson and Winter, 1992), suggests that a firm which engages in accessing external knowledge is better able to innovate by adding distinctive new knowledge variations which provide a wide enough range of choices to solve a new problem (e.g. Fleming and Sorenson, 2001; Katila and Ahuja, 2002; Rosenkopf and Nerkar, 2001). Several empirical studies support this line of argument (e.g. Henderson and Cockburn, 1994; Katila, 2002; Katila and Ahuja, 2002; Rosenkopf and Nerkar; 2001).

This study suggested that more than looking for novel technologies, lines of business tended to act on opportunities to transfer external knowledge when the external technology had some “market proof”. This concept seems to parallel the idea of

knowledge provenness (e.g. Rogers, 2003; Szulasnki, 1996). According to Szulanski (1996), knowledge with a proven record of past usefulness is easier to transfer. Without such a record, though, it is more difficult to induce potential recipients to engage in the transfer. In a more recent work, Szulanski (2000:14) has provided empirical evidence that it is exactly in the initiation stage that knowledge unprovenness has its strongest negative effect, i.e., if there is no evidence that the knowledge to be transferred has proven robust in other environments, initiating a knowledge transfer tends to be problematic. Showing that an external technology is market proven, however, not only demonstrates its past usefulness (Szulanski, 1996, 2000) but it also provides some evidence that the source of the external technology is legitimate (e.g. Parsons, 1960; Suchman, 1985) and reliable. Therefore, market provenness in the external technology sourcing process seems to go beyond Szulanski's (1996, 2000, 2003) notion of provenness of the knowledge's usefulness. It also encompasses a market and sometimes institutional endorsement to the source of the external technology (Stuart, Hoang and Hybels, 1999). This also seems to be in line with Rosenkopf and Nerkar's (2001:303) finding that when firms decide to use external knowledge "they are more likely to choose *well-regarded technology*" (*emphasis added*).

More interestingly, in many cases where scouters managed to convince the lines of business that there was an opportunity to transfer an external technology, the latter was not novel either to the industry or to Europ Telco itself. The fact that Europ Telco was already familiar with a specific technology however did not mean it was ready to introduce new services using it. More often than not, these technologies did not manage to cross the internal chasm between research labs and lines of business. The same (or very similar) technology coming from outside with customers (many times other telcos) and investors, on the other hand, provided the lines of business, which ultimately were

responsible for the introduction of new services, with a level of market proof that a technology developed internally could rarely provide. Thus, while previous research (e.g. Katz and Allen, 1982) has consistently documented the existence of the "not-invented-here" syndrome, notably among scientists, much less emphasis has been put on the case, identified in this study, where firms may suffer from the reverse problem, some kind of an "invented here" syndrome.

A notable exception is Menon and Pfeffer (2003:498) who showed that in fact managers sometimes "place a premium on external knowledge and face difficulties in transferring internal knowledge". Menon and Pfeffer (2003) describe in detail how Xerox developed the technology behind "Documents.com" three years before competition but did not make the service available to customers until external companies began to emerge with similar offerings. The authors point out at least two reasons for the preference for external knowledge: 1. valuing the knowledge of another internal actor can legitimate a direct competitor for organisation awards; and 2. the easy availability of internal knowledge may reduce its valuation, while external knowledge being scarcer is also perceived as unique which increases its perceived value.

By revisiting some of the quotes in Menon and Pfeffer's (2003) paper, such as "once Impresse [source of the external technology] started to get this huge market cap, and get all this visibility, then people felt much less risky about this one [Xerox's internal technology]" (2003:505) or "When there is a clear market indicator that it is of value and that people do find it to be a significant business offering that's validated" (2003:506), it seems clear to me that the idea of market proof as described above is also present in Menon and Pfeffer's data (2003). More importantly, while Menon and Pfeffer (2003:510) emphasize the negative effects of organisational preferences for external knowledge in terms of depressed morale among Xerox scientists, here I have shown that importing

proven external technologies can provide firms with a fast track to the introduction of new services. Assured by the fact that the external technology has already been adopted by the market and that there is a "*group of intelligent people somewhere ready to put their money where their mouth is and fund the [external] company*", lines of business are much more confident to launch new products or services, becoming more innovative than they would otherwise be.

This benefit of external technologies represent another mechanism that may explain the positive relationship between external knowledge sourcing and innovation performance. This has important implications to the stream of research examining the relationship between external knowledge sourcing and innovation performance (e.g. Laursen and Salter, 2006; Rosenkpof and Nerkar, 2001). Future research would benefit from investigating the real mechanisms behind this association instead of assuming that it is due to knowledge recombination.

These findings reveal an intriguing paradox: while the objective for creating the scouting units in the first place was to overcome local search and access novel technologies, the lines of business are more likely to act on opportunities to transfer technologies that are already market proven. Therefore, rather than favouring exploration (March, 1991), by focusing on market proven technologies, the organisation may be constraining its ability to do longer term innovation. In an environment that is dynamic, with frequent and rapid changes in technology, customer preferences and competition it seems appropriate to affirm that acting only on opportunities to transfer technologies that are market proven at best refines exploitation (March, 1991). This can provide the in-sourcing firm with a "first-order competence", which in a first moment can be a distinctive competence and generate a competitive advantage but the risk is that it may

lead firms to develop "core rigidities" (Leonard-Barton, 1995) or fall into "competency traps" (Levitt and March, 1988) in the longer term.

4.4.3. Knowledge Dissonance

In addition to "market provenness", my findings suggested that the level of fit between the external technology and the commercial model/vision of Europ Telco may also impact the likelihood of an opportunity to transfer an external technology being acted upon or not. More formally, I suggest that a new knowledge dimension—which I call knowledge dissonance and which does not seem to map onto any of the knowledge dimensions in the existing literature—is an important barrier to the recognition of and action upon opportunities to transfer external knowledge. Although previous literature has examined the importance of similar knowledge dimensions like relatedness (Hansen, 2002) or relevance (Schulz, 2001, 2003), dissonance seems to be a facet of knowledge that received much less scholarly scrutiny.

External technologies that I defined as dissonant were those that my interviewees reported as going against the "commercial or technological convictions" of the recipient unit. Using the vocabulary of my informants, these were external technologies that were "irritants" or that some recipient units had "antibodies" to. I believe that knowledge relatedness (e.g. Breschi, Lissoni and Malerba, 2003; Hansen, 2002; Sapienza, Parhankangas and Autio, 2004; Tanriverdi and Venkatraman, 2005) or knowledge relevance (Schulz, 2003) do not adequately capture the "lack of agreement" angle implicit in the dissonance dimension.

Knowledge relatedness has been defined in the extant literature as knowledge held in common (Sapienza et al., 2004:812) or as the level of overlap between two knowledge bases (Tanriverdi and Venkatraman, 2005). Breschi et al. (2003) provide a more nuanced

definition of knowledge relatedness by grouping knowledge relatedness in three categories: proximity, commonality and complementarity. Breschi et al. (2003:70) explain that knowledge can be related because firms may focus on new technologies that are quite proximal to the ones they are currently developing in terms of knowledge base (proximity category). Knowledge can also be related when a firm's innovative activities span more than one technology but the same type of knowledge is used in more than one technology (commonality). Finally, Breschi et al. (2003:71) argue that knowledge can be related when two different technologies need to be used together (complementarity).

Knowledge relatedness is usually measured by the level of overlap in patent classes or sub-classes. Jaffe (1986, 1989), for instance, measured knowledge relatedness among a sample of firms by looking at the overlap in the distribution of their patents in different technology fields. Breschi et al. (2003:77) explain that some studies have measured knowledge relatedness using bibliometrics where relatedness between fields of technology are measured through the analysis of the co-occurrence of classification codes assigned to individual patents. In a related vein, Hansen (2002) refers to knowledge relatedness equating it to whether two units have the same technical competence—for instance, digital processing, fault diagnostics or device physics (for a complete list see Hansen, 2002:245). Common in all the definitions and operationalisations above is the technical aspect of the knowledge relatedness.

The general argument in the extant literature is that related knowledge is easier to be transferred. Sapienza et al. (2004:813) posit that "if external knowledge is closely related to the previously held knowledge in the organization, its communication will be smoother and face less resistance". In other words, firms are more likely to be able to evaluate effectively the value of external knowledge that is related to their knowledge base (e.g. Cohen and Levinthal, 1990; Sapienza et al., 2004). I do not dispute this

argument but I suggest here that not all related knowledge is the same. More precisely, I argue that conceptually related (or unrelated) knowledge could be either consonant or dissonant, to the extent that two different firms may have knowledge in the same technical area and at the same time they may have profound disagreements in terms of the chosen technological standards or about how to profit from the use of such technology.

Let us contrast knowledge relatedness and knowledge dissonance in the context of this research. Companies developing technologies about Voice over Internet Protocol (VoIP) have knowledge that is related to the knowledge base of typical telcos, like Europ Telco. But the fact that Skype, a small start-up until few years ago, and most telco incumbents both had knowledge in the same technical area (VoIP), i.e. knowledge between them was related, did not mean that they had consonant knowledge. Quite the opposite, Skype and incumbent telcos have very different business models so although telcos can understand the technology developed by Skype, this technology is dissonant to them. Now compare this with the case of Vonage. Vonage also developed VoIP technologies but its way of commercialising such technologies (through a monthly subscription and a box to be connected to a customer's broadband modem) is very consonant to the way telcos operate. In fact, many telcos, including Europ Telco, are now offering VoIP services using the same model as Vonage. So this is a case of a related technology (VoIP) that can be dissonant or consonant.

There are also cases of unrelated technologies that can also vary in their level of dissonance. Technologies around Internet Protocol Television (IPTV) are usually unrelated to the knowledge base of a typical telco. There are, however, IPTV technologies that although unrelated are consonant to a typical telco business model. For instance, Microsoft developed software platforms for service providers to deliver connected TV services and new entertainment experiences to consumer audiences worldwide (e.g.

Microsoft Mediaroom). Although telcos may not be technically familiar with the IPTV technology developed by Microsoft, the latter was developed with the telcos' business models in mind and is quite consonant to their business models. Similarly to the case of Vonage, telcos which are now offering IPTV services tended to adopt Microsoft's technology. Conversely, Joost is another IPTV technology which distributes TV shows and other forms of video over the Web but, Joost uses peer-to-peer TV technology, which contradicts the telcos' way of commercialising this service. Therefore, Joost seems to be a case of an unrelated and dissonant technology. Table 4-7 below summarises those examples

Table 4-7: Knowledge Dissonance X Knowledge Relatedness

		Dissonance	
Relatedness		High	Low
	High	Skype	Vonage
	Low	Joost	Microsoft IPTV

Knowledge dissonance is also different from knowledge relevance (Schulz, 2003). Schulz (2003:442) studied the connection between knowledge inflows and knowledge relevance—the degree to which external knowledge has the potential to connect to local knowledge. Although one may be tempted to believe that knowledge relevance could be equated to knowledge dissonance, in a later part of his paper, Schulz (2003:444) ends up conflating knowledge that confirms with knowledge that contradicts in the same construct: he affirmed that relevance increases "with the extent to which extra-unit knowledge *elaborates, contradicts or strengths* local-knowledge" *(emphasis added).*

The findings of this study suggest, however, that external relevant knowledge that "elaborates or strengths" a firm's knowledge base may be more likely to be acted upon than external relevant knowledge that "contradicts" local knowledge. In sum, while relatedness and, to a certain extent, relevance seem to relate to the ability of the recipient unit to understand the incoming knowledge, knowledge dissonance has to do with the recipient unit's agreement with the knowledge it is exposed to.

It is also important to contrast dissonant knowledge with disruptive technologies (Christensen, 1997; Christensen and Bower, 1996). As Christensen and Bower (1996:201) explain disruptive technologies are very rare and have the ability to disrupt or redefine an industry's rate of improvement in product performance. In a more recent article, Adner and Zemsky (2006) argued that disruption happens when existing industry boundaries have to be redrawn by the entry of firms using disruptive technologies that end up displacing incumbent technologies from mainstream segments. Adner and Zemsky (2006:221) add that the "recent technology bubble, in which many promising new technologies turned out not to be disruptive, underscores the need to critically assess the substitution threat posed by the new technology". While disruptive technologies are definitely an example of dissonance, they represent only a small sub-set of what I define as dissonant knowledge. Unlike a disruptive technology that usually disrupts a whole industry; a technology is dissonant to a specific firm and does not necessarily imply any redefinition of the technology performance trajectory (Dosi, 1982). Therefore, a specific technology may well be perceived as dissonant by one firm and consonant by another, being both firms in the same industry. In other words, exposure to dissonant technologies is much more frequent than the emergence of disruptive technologies; as only very few of those dissonant technologies will ever have the potential to disrupt a focal industry. For

instance, in my sample although there were dozens of technologies that Europ Telco considered dissonant, only a couple of them could potentially be classified as disruptive.

In this study, I argue that despite the fact that knowledge dissonance remains practically unexamined by the recent literature on knowledge transfers (e.g. Ambos and Ambos, forthcoming; Gupta and Govindarajan, 2000; Hansen, 1999; Hansen and Lovas, 2004; Monteiro et al., 2008, Szulanski, 1996, 2000, 2003), its roots can be traced back to Festinger's (1957) theory of cognitive dissonance. Festinger (1957) suggested that a person's cognitive elements (e.g. knowledge, opinions, and beliefs about their selves, behaviour and environment) may be irrelevant to each other; they may have a consonant relationship or they may have a dissonant relationship. In other words, people hold a multitude of cognitions simultaneously and these cognitions form irrelevant, consonant or dissonant relationships with one another. Irrelevance simply means that two cognitions have nothing to do with each other; consonance means that one cognition follows from, or fits with, the other.

Dissonance, according to Festinger (1957:13), can be explained as follows: "two elements are in a dissonant relation if, considering these two alone, the obverse of one element would follow from the other. To state it a bit more formally, x and y are dissonant if not-x follows from y". The problem with cognitive dissonance is that it is unpleasant (Elliot and Devine, 1994), so people try to reduce the proportion of dissonant links by searching for new information that is not dissonant with other elements (Browstein, 2003). It follows that according to cognitive dissonance theory (Festinger, 1957) once committed to an alternative, people prefer supportive (consonant) information compared with opposing (dissonant) information to avoid or reduce post decisional conflicts.

I suggest that paralleling cognitive dissonance at the individual level, my data shows that the opportunity to transfer some external technologies may not be acted upon, if those technologies contradict the dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986) of the lines of business, i.e., the way in which their top managers conceptualise the business and make critical resource allocation decisions. Prahalad and Bettis (1986:491) observed: "dominant logic (…) is a mindset or a world view or a conceptualisation of the business and the administrative tools to accomplish goals and make decisions in that business. It is stored as a shared cognitive map (or set of schemas) among the dominant coalition".

Therefore, I suggest that a promising approach is to build on the concept of dominant logic and define dissonant knowledge within the organisational context as: "knowledge is dissonant when it is contrary to the organisation's dominant logic". And although knowledge dissonance is a knowledge dimension that has not been either theorised or operationalised in the knowledge management literature yet, it seems to speak directly to a stream of literature that has been putting an increasing emphasis on the role of managerial cognition in driving the dynamics of capabilities (Barr, Sitmpert and Huff, 1992, Garud and Rappa, 1994; Kaplan, Murray and Henderson, 2003; Kaplan, forthcoming; Kaplan and Tripsas, forthcoming; Tripsas and Gavetti, 2000). As Kaplan (forthcoming) put it managers' cognitive frames are a natural mechanism to connect ambiguities created by discontinuities to strategic choice. For example, frames filter managers' perceptions about what is happening and what action should be taken (Daft and Weick, 1984; Hambrick and Mason, 1984).

4.4.4. Conclusion

This study provided a detailed account of the challenges involved in the initiation of the external technology sourcing process. The process through which large multinational firms search for, recognise and act (or fail to) upon opportunities to transfer technologies across geographic and organisational boundaries tends to be highly complex and its success is a necessary, although not sufficient, condition for the incorporation of an external technology into a focal firm's knowledge base. This study is a first attempt to uncover an organisational process that so far has mostly been inferred by its outcome, typically from patent data (e.g. Almeida, 1996; Katila, 2002; Rosenkopf and Almeida, 2003; Rosenkopf and Nerkar, 2001; Sorenson and Stuart, 2000; Stuart and Podolny, 1996).

In addition, whilst most of the extant research has focused on the opportunities to transfer external technologies that have been acted upon (e.g. citations to external patents that have been cited or corporate venture investments that have been made), this study went one step back and examined the behavioural and cognitive patterns that help explain why MNCs act on some of those opportunities to transfer external knowledge and neglect many others.

In other words, by uncovering the initiation (Szulanski, 1996, 2000, 2003) of the external technology sourcing process, I was able to provide some novel insights on why some opportunities to transfer external technologies are more likely to be acted upon. My data indicate that initiation stickiness (Szulanski, 1996, 2000, 2003) may be often related to the difficulties in translating the external solution and in making its matching to specific areas within the MNC, rather than to accessing the external technology in the first place. In addition, the data in this study also revealed that external technologies that come with market "provenness" may be more likely to get the attention and the interest of

managers, even if a similar technology was available internally (Menon and Pfeffer, 2003). Interestingly, this finding seems to suggest that the benefits of external knowledge sourcing in some cases may be less related to the provision of another range of choices to solve new problems (March, 1991; Katila and Ahuja, 2002), than with the offering of a market-proven solution to an existing problem. Conversely, external technologies that did not fit with the sourcing firm's dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986) may not be acted upon, regardless of their technical relatedness (e.g. Hansen, 2002) or relevance (Schulz, 2003).

This study is subject to a number of limitations. There is obviously the inherent limitation of the method, which does not readily lend itself to generalizations. And the telecommunication services providers industry was chosen for reasons of appropriateness rather than representativeness (Miles and Huberman, 1994). These are limitations that I will not be able to address in the next study and that I will examine again in the last chapter of this dissertation.

There are other limitations, however, that a quantitative work based on the same Rock database entries, and complemented by other data sources, can potentially address. More precisely, this qualitative study aimed at answering two research questions: 1) What is the process through which MNCs search for, identify and act upon (or fail to) opportunities external technologies across geographic boundaries?; and 2) What are the barriers and facilitators that explain why some identified external technologies are acted upon while others receive no action?

Given its own design (and purpose), it could not shed light on my third research question, i.e., what is relative impact of those barriers and facilitators on the likelihood of a successful initiation—i.e. on the chances of an opportunity to transfer an external technology being acted upon?

In other words, if the qualitative paper suggested that, for instance, knowledge dissonance and market provenness may have an impact on the likelihood of an opportunity to transfer external technology being acted upon, we have no indication of the relative impact and statistical significance (if any) of those factors. We also cannot infer whether those two factors interact. Also, we do not know whether the efforts spent in internal and external search, internal selling and matching have any significant impact on the odds of a successful initiation. In addition, only with the findings of the qualitative study we cannot infer if the impact of the factors described above would remain statistically significant even after controlling for other factors that are well-established in the existing literature, such as knowledge relatedness, tie strength, geographic distance or motivation of the source and of the recipient unit.

To address those questions, among others, I conducted a quantitative study that empirically test the relative impact of both process-related factors and attributes of the external technology on the likelihood of a successful initiation. Chapter 5 presents the motivation for this study and develops hypotheses, while Chapter 6 describes the methodology used and Chapter 7 discusses the findings from this quantitative study.

CHAPTER 5. QUANTITATIVE STUDY - MOTIVATION

5.1. INTRODUCTION

In the prior chapters, my focus was on uncovering the *process* through which MNCs scout the globe looking for opportunities to transfer external technologies. And by shedding light on this process, I have also provided some novel insights into the behavioural and cognitive patterns that may explain *why* some identified opportunities to transfer external knowledge are acted upon while others are neglected and receive no action.

For instance, the results from the qualitative study indicated that technology scouting is a multi-staged process which goes much beyond external search, involving significant efforts in internal search, internal selling and matching. My findings also indicate that external technologies may be acted upon because they come with market provenness. Finally, I also showed that even when the external knowledge is related to the firm's knowledge base, it may not receive any attention if it does not fit with the dominant logic of the recipient unit.

In this quantitative study, I try to assess the relative impact of those factors on the likelihood of an external technology being acted upon by the recipient unit within the MNC. In the next chapters, I examine the importance of the factors that emerged from the inductive study described in the previous chapters in facilitating (or making more difficult) the initiation of an external technology sourcing process. If the first study addressed the *how* and *why* questions, in the next chapters I go one step further and test the relative impact of specific factors on the likelihood of a specific opportunity to transfer external technologies being acted upon (i.e. the *how much*). While the qualitative study focused on the technology scouting *process*, the quantitative paper focuses on its *outcomes*.

Thus, in this study I build both on the qualitative study above and on previous literature to address the following research question: what is the relative impact of the

barriers and facilitators that emerged in the qualitative paper on the likelihood of a successful initiation—i.e. on the chances of an opportunity to transfer an external technology being acted upon?[21]

5.2. THEORY AND HYPOTHESES

Researchers from different disciplines, using different methods, and studying different contexts have already provided the field with many explanations and insights about managing knowledge within MNCs and the inherent barriers and facilitators to knowledge transfers have been extensively analysed from different angles (Argote, McEvily and Reagans, 2003). Two relatively recent developments of this stream of literature shape my research approach in this study.

First, although some scholars initially focused almost exclusively either on the attributes of the knowledge transferred (e.g. Winter, 1987; Zander and Kogut, 1995) *or* on the situation in which the transfer occurs (e.g. Arrow, 1969), more recently researchers tended to adopt a more eclectic model that allows the relative importance of each set of factors to be measured (e.g. Hansen, 1999; Hansen and Lovas, 2004; Gupta and Govindarajan, 2000; Monteiro et al., 2008; Szulanski, 1996; Tsai, 2001).

Second, Szulanski (2000) has showed that different factors will have different impact depending on the stage of the knowledge transfer. For instance, factors that affect the opportunity to transfer (e.g. knowledge provenness) are more likely to predict difficulty during the initiation stage, while factors affecting the execution of the transfer (e.g.

[21] As I will describe in detail in Section 6.2.1. below, in this study a initiation is operationalised as successful when the transfer-memos were followed-up by the recipient unit, typically by arranging a meeting with the source of the external technology.

recipient's absorptive capacity) are more likely to predict difficulty during the subsequent implementation stages (Szulanski, 2000:9).

I build on those two points. First, I also adopt here an eclectic perspective to the extent that I investigate the impact of not only the attributes of the knowledge transferred (i.e. knowledge dissonance and market provenness) but also of the situation in which the transfer occurs (i.e. the level of effort scouters make in external and internal search, internal selling and matching)[22]. Second, I focus on understanding the factors that affect the success of one specific stage of the transfer process: the initiation stage.

More precisely, I will develop below two sets of hypotheses. The first one (Hypothesis 1-3) addresses the impact of two characteristics of the external technologies (their level of dissonance and market provenness) on the odds of a successful initiation. The second set of hypotheses (Hypotheses 4-7), on the other hand, focuses on how much process-related activities influence the likelihood that an opportunity to transfer an external technology will be acted upon. It is important to note here that in the next chapter, I will be re-iterating the findings from the qualitative study (Chapter 4) in order to make the development of the hypotheses coherent and logical.

5.2.1. Knowledge Dissonance

The findings of my qualitative study suggested that the level of fit between the external technology and the commercial model/vision of the recipient unit within Europ Telco may impact the likelihood of an opportunity to transfer an external technology being acted upon or

[22] In addition to the attributes of the knowledge transferred and to the situation where the transfer occurs, the attributes of the source and of the recipient units also have an impact on the success of a transfer (e.g. Argote et al., 2003). As described in detail in Chapter 6 (more precisely in Section 6.2.3) I included a number of control variables to take account of the characteristics of the source and of the recipient units (e.g. source age and size, recipient units dummies). On top of that, knowledge attributes like knowledge dissonance and knowledge relatedness also take into consideration attributes of the recipient unit.

not. As discussed above, scouters reported a strong difficulty in getting action on opportunities to transfer external technologies that go against the "commercial or technological convictions" of the recipient unit. And their perception was that the difficulty was not due to a difficulty in understanding the external technology. Instead, the source of the difficulty seemed to be linked to a "lack of agreement" rather than a "lack of understanding".

I therefore suggested that this lack of agreement represented a new knowledge dimension—which I called knowledge dissonance and which does not map onto any of the knowledge dimensions in the existing literature. And I also suggested that despite the fact that knowledge dissonance remains practically unexamined by the recent literature on knowledge transfers (e.g. Ambos and Ambos, forthcoming; Hansen, 1999; Hansen and Lovas, 2004; Gupta and Govindarajan, 2000; Monteiro et al., 2008; Szulanski, 1996), its roots can be traced back to Festinger's (1957) theory of cognitive dissonance.

According to cognitive dissonance theory (Festinger, 1957) once committed to an alternative, people prefer supportive (consonant) information compared with opposing (dissonant) information to avoid or reduce post decisional conflicts. Cognitive dissonance is unpleasant (Elliot and Devine, 1994) and people try to reduce the proportion of dissonant links by searching for new information that is not dissonant with other elements (Browstein, 2003). This effect has been labelled selective exposure to information or confirmation bias (Jonas et al., 2001:557). A very illustrative example of how this bias has been tested in experiments is provided by Jonas et al. (2001:558): participants of an experiment are confronted with a decision case—for example, whether a company should invest in a particular developing country—and are asked to reach a preliminary or final decision. After that, participants are offered additional pieces of information (articles) that they can select. In most experiments, these pieces of information are presented in the form of commentaries by experts. The participants are given a list of the topics of these articles where it is apparent

whether the articles in question are consonant or dissonant to the previous decision. Then participants are asked to indicate which articles they want to read. Although half of the articles are consonant and half are dissonant, participants end up choosing more consonant articles than dissonant ones.

Recent studies have also demonstrated that such a confirmation bias is not restricted to situations where a final decision has been made (a similar bias arises after preliminary decisions) and, more importantly, this confirmatory information search can also be observed in group decision making (Schulz-Hardt, Frey, Luthgens and Moscovici, 2000).

For all those reasons, I argue that external technologies that are dissonant are less likely to be acted upon by the recipient unit. However, in order to translate the idea of cognitive dissonance from the individual level, where it has been widely applied, to an organisational level, I suggest the utilisation of an intervening concept: dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986).

Prahalad and Bettis (1986:490) coined the term "dominant general management logic" (or simply "dominant logic") and suggested that it can be observed as the way in which top managers conceptualise the business and make critical resource allocation decisions—be it in technologies, product development, distribution, advertising, or in human resource management. They explained: "dominant logic (…) is a mindset or a world view or a conceptualisation of the business and the administrative tools to accomplish goals and make decisions in that business. It is stored as a shared cognitive map (or set of schemas) among the dominant coalition" (Prahalad and Bettis, 1986:491). Combining cognitive dissonance theory (Festinger, 1957) with the concept of dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986), I suggest that knowledge is dissonant when it goes against the recipient unit's dominant logic.

Thus, I hypothesize that, everything else equal, recipient units will be less likely to act on opportunities to transfer dissonant external technologies. More formally, I predict

Hypothesis 1 – Ceteris paribus, the more dissonant the external technology the lower the likelihood of a successful initiation

5.2.2. Market Provenness

Extant literature (e.g. Katz and Allen, 1982) has consistently documented the difficulties in bringing external ideas inside, explaining that frequently there is a "not-invented-here" syndrome, notably among scientists, where technologies developed outside the firm are likely to be rejected.

Much less scholarly attention has been devoted to understand the cases where external technologies are indeed internalised. I argue that in those cases where the lines of business can be assured that the external technology has already been adopted by the market and that there are investors funding the technology, they are much more confident to act on an opportunity to transfer an external technology than they would otherwise be.

I posit that the concept of market provenness helps to explain why some external technologies are acted upon while others receive no action. This parallels Szulanski's (1996:31) concept of knowledge unprovenness in the context of transfer of best practices within the firm. According to Szulanski (1996), knowledge with a proven record of past usefulness is easier to transfer, while when such a record is lacking, it is more difficult to induce potential recipients to engage in the transfer. In a more recent work, and more importantly to this study, Szulanski (2000:14) has provided empirical evidence that it is exactly in the initiation stage that knowledge unprovenness has its strongest negative effect,

i.e., if there is no evidence that the knowledge to be transferred has proven robust in other environments, initiating a knowledge transfer is less likely to succeed. The fact that the external technology is commercially available, has customers and investors may also indicate that the external party is a reliable source which has the endorsement of other market actors (e.g. Stuart et al., 1999).

In addition, organisations that have customers and investors backing it are likely to be perceived as legitimate which enhances their credibility and their likelihood to receive resources from other organisations (Parsons, 1960; Suchman, 1985).

Taken together, these arguments suggest the following hypothesis

Hypothesis 2 Ceteris paribus, the more proven the external technology; the higher the likelihood of a successful initiation.

5.2.3. The moderation of market provenness on knowledge dissonance

While knowledge dissonance is likely to reduce the chances of a successful initiation, the fact that the external technology has been market proven may reduce the tendency of it being dismissed simply because it does not fit with the dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986) of the recipient unit. Managers in the lines of business may be more interested in acting on an opportunity to transfer an external technology that, although dissonant to their existing commercial model and cognition, has customers and investors supporting it. In other words, faced with evidence that a focal external technology has been market proven, managers in the recipient units may feel less sure about the appropriateness of their existing dominant logic and be more inclined to follow-up on the opportunity to transfer the external technology. Thus I predict:

Hypothesis 3 Market provenness mitigates the negative effect of knowledge dissonance on the chances of a successful initiation

5.2.4. External Search

One of the key tasks performed by the scouters is to search the environment for opportunities to transfer external technologies. Search involves looking for, identifying and evaluating knowledge resident in other organisations (Hansen et al., 2005).

As we know from "A Behavioural Theory of the Firm" (Cyert and March, 1963), this search can be triggered because a problem was found within the organisation. This leads to a problemistic search that is stimulated by a problem and is directed toward finding a solution to that problem. Alternatively, according to the theory of slack search, also developed by Cyert and March (1963), organisations that have slack may start to search for new solutions even when they are not solving specific problems, which complements the theory of problemistic search (Argote and Greve, 2007).

As Szulanski (1996, 2000, 2003) explains, both in a problemistic and in a slack search, a successful initiation will depend on how difficult it is to find an opportunity to transfer. A "global" search across all companies would be extremely time-consuming, if not impossible (Hansen, 1996; Szulanski, 2000). Therefore, search inevitably is an uncertain and complex process, and the specific opportunities to transfer external technologies often are not known to the scouters *ex ante*. And even after a potential opportunity is identified scouters have to spend some time evaluating it, which may take significant time (Hansen et al. 2005; Szulanski, 1996, Teece, 1976).

Therefore, the amount of effort scouters put in this external search process is likely to influence the chances of a successful initiation. Regardless of how or why search was

triggered, the more effort scouters devote to external search the more likely they are to find an opportunity to transfer an technology, which will be considered useful by other units within the organisation and therefore such opportunity is more likely to be acted upon. Thus, I predict that:

Hypothesis 4 Ceteris paribus, the higher the external search effort the higher the likelihood of a successful initiation.

5.2.5. Internal Search

The findings of the qualitative study also revealed that search is more than external search, as scouters also engaged in internal search within the organisation. In fact, my informants reported that it could be even more difficult to make sense about what they should be looking for than "finding" the external technology once they have learned how "to position their radars". For the managers in the lines of business, disclosing their technological needs also meant letting other areas know their weaknesses and constraints, which was not something they were prepared to do voluntarily.

Thus, scouters had to spend time searching internally in order to extract that "book of pain points" from the lines of business and make sense of what they should be looking for in the external environment. In other words, although existing literature mostly equates external knowledge sourcing to external search, Szulanski (2000:13) acknowledges that the eventfulness of the initiation stage may increase when existing operations are inadequately understood. I argue, thus, that everything else equal, the more effort scouters make in searching the internal environment for the lines of business's requirements and constraints the

more prepared they are to identify external technologies that will be acted upon. More formally,

Hypothesis 5 Ceteris paribus, the higher the internal search effort the higher the likelihood of a successful initiation.

5.2.6. Internal Selling & Matching

Once scouters have looked for and identified an opportunity to source the technology from another firm, they have to share their knowledge about that opportunity to transfer an external technology with another unit within the firm.

As described in the qualitative study, the materialisation of this knowledge transfer from the scouting units to the recipient units was done through the elaboration of the transfer-memos.

Scouters play a pivotal role in manipulating what they know about the external technology (e.g. Brown and Duguid, 1991, 1998; Pawlowski and Robey, 2004) before they try to convince other units within the organisation that there is an opportunity to transfer a specific external technology. As described in the communities of practice literature (e.g. Brown and Duguid, 1991; Pawlowski and Robey, 2004; Wenger, 1998), this process of translation seems to involve framing the elements of one community's world view (e.g. start-up in Silicon Valley) in terms of another community's world view (e.g. a large incumbent telco in Europe).

In addition to writing the memos, scouters had to "sell" them internally. In other words, rather than simply including another entry in the database, scouters actively contacted

managers in the recipient unit aiming at increasing the likelihood that their memo will be followed-up. Therefore, although all memos used the same template and followed a standard procedure, the amount of time spent by scouters writing in this stage of the process varied considerably. In fact, the literature on issue selling (e.g. Dutton and Ashford, 1993; Dutton et al. 1997; 2001; 2002) has shown that the extent to which managers lobby internally for their ideas has a significant impact on decision makers' attention and initiative acceptance. Thus I predict that,

Hypothesis 6 Ceteris paribus, the more effort scouters devote to internal selling, the higher the likelihood of a successful initiation

Translation allows the external technology to be understood within the specific context of the focal firm. However, it may not necessarily trigger any action from specific internal actors, especially in large organisations. I argue that the ability to match the external technology to a specific manager or team increases the likelihood of an opportunity to transfer external knowledge to be acted upon.

More precisely, the initiation of the technology sourcing process is more likely to be successful if connections between external and internal actors can be made across the boundaries between them (Hargadon and Sutton, 1997). Managers working at the scouting units are not only scouters in the sense that they not only "reconnoitre the external environment for the purpose of making discoveries or acquiring information" but they are also brokers. Their brokerage activity, however, differs from the traditional *tertius gaudens* orientation emphasized in the structural holes theory (Burt, 1992, 2000; Simmel, 1950), which consists of the advantage a broker has by playing people off against one another for his

or her own benefit. Instead, scouters have a *tertius iungens* strategic orientation (Obstfeld, 2005), where they "facilitate transactions between other actors lacking access to or trust in one another" (Marsden, 1982:202). As Obstfeld put it (2005:105) "given a relevant structural hole, *tertius gaudens* profits by maintaining separation among alters, whereas *tertius iungens* closes it to coordinate action". Consistent with this view, I predict that

Hypothesis 7 Ceteris paribus, the matching of the opportunity to transfer an external technology to a specific manager (or team) within the focal firm increases the likelihood of a successful initiation.

CHAPTER 6. QUANTITATIVE STUDY – METHODOLOGY

6.1. SAMPLE AND DATA COLLECTION

To test the above propositions I used both archival (from internal and publicly available databases) and survey data. The unit of analysis in this study is the specific opportunity to transfer an external technology represented in a transfer-memo and the main internal data source was Europ Telco's Rock database (please refer back to Section 3.2 for more information on this database). As described in Chapter 3 above, the standard procedure Europ Telco's managers used to transfer their knowledge about opportunities to transfer external technologies they identified was to complete a standardised form containing detailed information about the external technology, its source and its relevance to Europ Telco (please refer back to Table 3.2 above and to Appendix 7 for the fields in this form). All those completed forms were kept in a proprietary database called Rock. Upon the signature of a non-disclosure agreement, I have been given access to 137 entries in the Rock database representing 96% of all the external technologies formally assessed by Europ Telco's scouting unit in Palo Alto, California in the period between January 2003 and December 2005[23].

In addition and based on the field research in the qualitative study reported before, I identified a number of variables (e.g. internal and external search effort; knowledge dissonance, potential innovation dividends, tie strength) that were likely to have an impact on the dependent variable (the likelihood of a successful initiation) but which were not captured either by Europ Telco archives or by the publicly available databases. Thus, a survey to

[23] There were five entries in this period that were not included in my database. These entries were excluded by Europ Telco before they gave me access to the database. According to the company, those entries revealed internal information that was still sensitive at the time of this study. There was no *prima facie* indication, however, that those entries were qualitatively different from the rest of the sample, along the dimensions examined in this study.

collect those variables was necessary. The procedures for developing and administering this survey were as follows. The survey instrument was designed on the basis of interviews conducted in the qualitative study and using items from prior studies where available. I first developed pilot designs that were pre-tested in one-hour long face-to-face interviews with one former scouter, one manager in one line of business and with one R&D manager. During these tests, I made minor modifications in the questions that did not make sense in Europ Telco's setting or that were ambiguous or in other ways misconstrued. I then went back to some of those managers with the modified questions, to which they responded. We then discussed their new responses over the phone.

I then split the 137 external technologies according to their lead contact within Europ Telco's scouting unit and sent to this manager a customised survey (attached in Appendix 8) with the names of all the companies that he[24] input in the Rock database between January 2003 and December 2005. I sent the survey both by email (a Word file) and by fax. I ensured all of them that their responses would only be reviewed by me and no one else in the company and that their data would only be reported at the aggregate level. They were told they could return their responses either by email or fax. After four weeks, I had received approximately one-third of the responses. I followed-up by phone with the managers' assistants and scheduled phone calls to go through the survey instrument with the respondents who had not completed the survey. After eight weeks, I had increased response rate to approximately 65%. I finally obtained the agreement of Europ Telco's Senior Vice President responsible for the scouting units to visit the unit in Silicon Valley again, when I met face-to-

[24] All scouters in this study were male.

face with all the managers again and asked if we could through the surveys together. At the end, all surveys were completed[25].

Although the Rock database contained detailed information about the external technologies, it was less informative as to whether a specific entry received any action from the recipient unit within Europ Telco or not. In order to obtain that information, I accessed the scouting units' internal records which kept track of the outcome of every single entry of the Rock database. The timing of accessing those records was critical though. Managers at Europ Telco estimated that it could take up to one year for a unit within Europ Telco to act on an external technology that was identified in a transfer-memo. Therefore, it was necessary to have constant access to Europ Telco and this variable, which is the dependent variable in this study, was the last one I collected, in June 2007, after a period well in excess of one year after all entries were input in the database[26].

In addition to those internal sources, I collected data from Venture Economics Database and from the United States Patent and Trademark Office (USPTO)[27].

6.2. MEASURES

6.2.1. Dependent Variable

Success of the initiation of the external technology sourcing

The dependent variable is whether the initiation of the external technology sourcing was successful or not. The scouting units' activities are virtually inconsequential, unless another

[25] As I report below, in order to test for inter-rater reliability, I randomly selected 30 entries (approximately 20% of the sample) and asked the second contact (in addition to the lead contact) to complete the survey. The correlation between the answers of the lead contact and those of the second contact ranged from 0.71 to 0.91.
[26] As I describe in the robustness checks section, I also run an alternative model with a control variable called "time lapsed" to account for the number of days between the entry date and June 2007. All results remained qualitatively the same.

unit within Europ Telco acts on the opportunity to transfer the external technology identified by the scouters. Similarly, as my fieldwork indicated, the transfer memos did not contain a detailed description of the external technology that would allow the recipient unit to do any in-depth analysis or make an informed decision about that technology based on the memo. Rather, the purpose of the memos was to provide a very relevant, precise assessment of an opportunity to transfer an external technology in such a way that the recipient unit could understand the nature of the opportunity and be interested in following-up on it. In a nutshell, transfer memos were not an end in themselves but just the first step in connecting the dots between the external source and a specific unit within Europ Telco.

As this follow-up was a very critical performance indicator for the scouting units, Europ Telco kept updated records of the outcome of each entry in the Rock database. I measured success of the initiation as a dichotomous variable which took the value of 1, if the transfer-memo was acted upon and zero otherwise[28]. Action or follow-up on a transfer-memo was typically the arrangement of a meeting between the source of the external technology and the recipient unit within Europ Telco[29]. In the cases where there was no action from the recipient unit, there was a note in the scouting unit's records indicating that the recipient unit has been contacted and that nevertheless there was no follow-up from such a unit[30].

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[27] This was possible because all entries in the Rock database contained the name of the source of the external technology

[28] Success of a knowledge transfer has been previously captured either using perceptual measures (e.g. Ambos and Ambos, forthcoming; Gupta and Govindarajan, 2000) or completion time (e.g. Hansen, 1999). There are important limitations in using perceptual measures (e.g .Gupta and Govindarajan, 2000:491). Completion time is unlikely to be a good measure of success of the initiation stage, not to mention that a precise indication of when the follow-up took place was not available for most cases. Therefore, I opted for a dichotomous variable that notwithstanding its limitations is objective and reliable (see footnote 30 below).

[29] There were six cases where the outcome was a video conference, instead of a face-to-face meeting. I counted those cases as a successful initiation. I have also run all the models without those six observations and the results are qualitatively the same.

[30] It was plausible, however, that the scouting units' managers had an incentive to inflate their records of the entries which were followed-up. In other words, the scouting unit's records that I had access to may have showed a higher number of successful cases than reality. In order to check for the reliability of those records, I randomly selected 15 successful entries (roughly one third of the total successful cases) and contacted directly the recipient unit, either by email or by phone. In *all* cases, the recipient units confirmed the records of the scouting unit. Given this high reliability and the fact that scouters had no incentive in under reporting the number of successful cases, I have not selected a sub-sample of cases where the records showed an unsuccessful

6.2.2. Independent Variables

Knowledge Dissonance

I have suggested above that in order to apply cognitive dissonance at the organisational unit level, it was necessary to refer to the recipient unit's dominant logic (Prahalad and Bettis, 1986). The challenge is that dominant logic is not easily operationalised. Bettis and Prahalad (1995:9), for instance, suggested that dominant logic can be partially identified by thoroughly interviewing top managers about their views of strategy and the industry and affirmed that "research is underway to develop better methods of directly assessing dominant logic". More than ten years later, Bettis and Prahalahd's operationalisation of dominant logic, however, remains to be provided.

In a rare attempt to operationalise dominant logic, Grant (1988:639) argued that the problem of dominant logic as conceived by Prahalad and Bettis (1986) is that it is a cognitive concept and as such its applicability to empirical research is limited. Grant (1988) thus suggests that dominant logic be examined not as a mind set or collection of schemas but as a set of specific corporate-level functions. More precisely, Grant (1988:640) argues that corporate management can be regarded as undertaking three critical functions: 1. allocating resources between businesses; 2. formulating and coordinating business unit strategies and 3. setting and monitoring performance targets for business units. Two businesses would share the same dominant logic if they are strategically similar in those three critical functions. For example, in terms of resource allocation, size and time span of investment projects as well as sources of risk are determinants of strategic similarity. Similarity in terms of strategy

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outcome and systematically contacted the lines of business. I took advantage, however, of my interviews with the managers in the lines of business to talk about the memos they received and were not followed-up. Again,

formulation has to do with sharing similar key success factors and stages of the industry life cycle.

If on the one hand Grant's (1988) suggestions make the dominant logic concept much more tractable, on the other, and somehow paradoxically, it leaves out the most important contribution of Prahalad and Bettis (1986) which is exactly the managerial cognition component of dominant logic. Also, Grant's (1988) operationalisation seems to be more applicable at the corporate level rather than at the business unit level.

I suggest here that an operationalisation of dominant logic that is tractable and simultaneously maintains its cognitive dimension is to think of an organisation's (or one of its business units') dominant logic in terms of its business model (Amit and Zott, 2001; Chesbrough and Rosenbloom, 2002; Chesbrough, 2003a; Zott and Amit, 2007, 2008). Amit and Zott (2001:511) defined business model as "the structure, content and governance of transactions' between the focal firm and its exchange partners". More recently, though, the same authors, acknowledged the more holistic aspect of a business model, affirming that it refers to "the overall *gestalt* of these possibly interlinked boundary spanning transactions" (Zott and Amit, 2008:3).

In a similar vein, Chesbrough (2003a:70) posited that constructing a business model requires managers to deal with significant complexity and ambiguity and we know from earlier research (e.g. March and Simon, 1958; Simon, 1947) that managers cannot—and do not—exhaustively evaluate every alternative when they confront such situations. Chesbrough (2003a:90) summarizes: "A business model is a double-edged sword for the corporation. It unlocks the potential value in a new innovation, but its very success can create a subtle, cognitive trap for the company later. An effective business model creates an internal logic of its own for how value is created and claimed. Every subsequent opportunity is evaluated in

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there was no mismatch between the scouting unit's records and the lines of business' accounts.

the context of this *dominant logic*…" (*emphasis added*)[31]. Building on Chesbrough and Rosenbloom's (2002:533) "detailed and operational" definition of business model, I operationalised knowledge dissonance as the level of disagreement between the business model underlying the external technology and the business model of the recipient unit. More precisely, the lead scouter responsible for the entry was asked to rate in a 1-5 Likert scale (where 1=very low and 5=very high) the level of fit or agreement between the business model underlying the external technology and that of Europ Telco's line of business the transfer memo was sent to, along the following dimensions: 1.value proposition; 2. market segment; 3.value chain structure; 4. cost structure and profit potential and 5. technological standards[32].

Factor analysis of the five dimensions above is consistent with them forming a single, unidimensional variable, and the scale is reliable with Cronbach Alpha = 0.84. I reverse coded the responses and added the score for each of the five dimensions to get a cumulative score for knowledge dissonance. This construct has a potential value range from 5 to 25. The greater score the greater is the level of dissonance of the external technology in relation to the dominant logic of the recipient unit.

Market Provenness

[31] I should clarify though that I am not equating the concept of dominant logic to the concept of business model but rather I am only suggesting that latter is good proxy for the former. Given that a business unit's business model is usually more easily observable than alternative measures of dominant logic such as "the shared cognitive map (or set of schemas) among the dominant coalition" (Prahalad and Bettis, 1986:490) or their "beliefs structures and frames of reference" (Bettis and Prahalad, 1995:7), using the recipient unit's business model as a proxy of its dominant logic seems to be an appropriate operationalisation of a very complex construct. I should also highlight that using business model as a representation of dominant logic is not very distant to Prahalad and Bettis's (1986:490) original assertion that dominant logic can be observed as the way in which top managers conceptualise the business and make critical resource allocation decisions—be it in technologies, product development, distribution, advertising, or in human resource management.

[32] The ideal respondent for that question would have been the manager in the recipient unit to whom the transfer memo was sent. Unfortunately, it was not possible to get access to all managers who received the transfer memos in my sample. I managed, however, to obtain the recipient units' score for 23 entries which were a good representation of the total sample. The correlation between the scouters' scores and the recipient units' score was high (0.78). In addition, as described in footnote 25, for 30 entries I obtained the ratings from the second contact within Europ Telco. For this item (knowledge dissonance), the correlation between the scores of the lead contact and the scores of the second contact was also good (0.81).

Based on my fieldwork three key dimensions indicated the market provenness of a technology: 1. its commercial availability; 2. whether there are customers using the technology and 3. whether there are investors funding the source of the technology. Based on the information contained in the Rock database entries, market provenness was measured by the sum of the following six dummy variables: 1. technology is commercially available (1=yes; 0=no); 2. Technology is in trials/beta versions (1=no; 0=yes); 3. there are customers buying the technology (1=yes; 0=no); 4. there are other telcos buying the technology (1=yes; 0=no); 5. there are venture capital investors funding the company (1=yes; 0=no) and 6. Company is still in the seed stage (1=no; 0=yes). Those six items were added to form a cumulative score[33]. Factor analysis of the six items above is consistent with them forming a single, unidimensional variable, and the scale reliability was good with Cronbach Alpha = 0.80. A second rater independently coded this variable and the inter-rater reliability was good (0.84).

Search Effort

I argued that the amount of search effort is likely to increase the likelihood that the identified external technology will be acted upon by the recipient unit. One of the key findings of my qualitative study, however, was that technology scouting involved not only external but also internal search. Therefore, I measured internal search and external search efforts separately.

External search effort: Based on the scale used by Reuer, Arino and Mellewight (2006), the survey asked respondents to indicate in a scale 1-5 (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time) how much time was spent in the "external search", i.e., searching the external environment looking for the source of the external

[33] As I will discuss in the robustness checks section, the results were robust to different operationalisations of

technology that could meet the requirements/needs of the line of business [which was the recipient unit]?[34]

Internal search effort: A similar scale was used to measure internal search. More precisely, respondents were asked to "please indicate in a scale 1-5 (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time) how much time was spent in the "internal search", i.e., identifying the roadmap of the line of business [which was the recipient of the transfer memo] and in understanding its requirements/needs?"

Internal Selling Effort

Similarly, respondents were asked to indicate in a scale 1-5 (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time) how much time was spent in the "internal selling", i.e., trying to translate the external technology to Europ Telco's language and to "sell" it to the recipient unit?[35]

Matching

My qualitative study indicated that a key task performed by the scouters was to match the external technology to a specific manager(s) and/or team(s) within Europ Telco. Based on

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market provenness.

[34] An alternative, and more objective way, of measuring the internal and external search effort would be to estimate the number of full-time employee days spent in each of the activities (e.g. Hansen, 1999; Hansen et al. 2005). Although this was one of the questions in the original survey, when I was piloting the survey the respondents admitted that it would be very difficult for them to provide this estimate. Thus, it was not possible to collect this objective data regarding all entries. I took, however, two procedures to check the reliability of the perceptual measures. First, as described above, I also collected the estimates from a second respondent for 30 entries. The correlation between the two answers was 0.75 (internal search) and 0.71 (external search). Additionally, I asked the head of the scouting unit to provide me with the full-time employee days estimates for as many entries as he could. Estimates for 29 entries were provided. The correlation between the perceptual measure of internal search effort and the full-time employee days estimate was 0.78, while the correlation between the two external search measures was slightly lower (0.73). Those high correlations between different respondents and between the perceptual measure and the full time employee days measure provide additional confidence that the measures used in here are a good representation of the actual effort spent in internal and external search activities.

the information contained in the Rock database entries, I measured matching as a dichotomous variable that takes the value of 1 if the transfer-memo indicates a specific area and/or manager which the external technology is relevant to and zero otherwise. A second rater independently coded this variable and the inter-rater reliability was high (0.89).

6.2.3. Control Variables

Knowledge relatedness

The first control variable concerns the obvious alternative explanation that external technologies that are related to the knowledge base of Europ Telco are the ones that are more likely to be acted upon. Thus controlling for knowledge relatedness between the external source and Europ Telco was crucial. Patent-based measures of knowledge relatedness are probably the most widely used method for controlling for knowledge relatedness. Although I use those measures in my robustness checks (and the results are robust to these specifications), using patent-based measures reduces drastically the number of observations in my models because only approximately 70% of the sources of the external technologies in my sample had patents (or patent applications) at the time the transfer memo was written.

Therefore, following Wadha and Kotha (2006:826), I chose to operationalise knowledge relatedness on the basis of industry and developed a concordance between Europ Telco's SIC code (4813) and the Venture Xpert Industry Code Classification Codes (VEIC) assigned to the sources of the external technologies.[36] An external technology was considered related to Europ Telco's knowledge base if its VEIC code was in the 1200 (Telecommunications) or 1300 (Wireless Communication) categories. The knowledge

[35] The same limitation and the same remedial procedures described in footnote 34 were adopted here. The correlation between the two respondents was 0.74 and between the perceptual measure and the full time employee days measure was 0.71.
[36] Out of the 137 companies in my sample, 121 had a VEIC code assigned to them.

relatedness measure is a dummy variable which takes the value of 1 if it is related knowledge and 0 otherwise[37].

Age and size of the external source

Older and larger firms may be perceived as more reliable and legitimate and this is likely to have an impact of the odds of a successful initiation. To control for these effects, I included 1. a variable called "Source age (years)" which is the number of years of the source of the external technology at the date the relevant transfer memo was written, and 2. a variable called "source size" which is the amount in US$ that the source of the external technology had received in investments at the date of the transfer memo. This amount was converted to a natural logarithm in order to dampen the high variability in size and achieve a more normal distribution.

Motivation of the source

It is plausible that some firms may be more motivated to transfer their technologies to Europ Telco and the motivation of the source may impact the likelihood of a successful initiation (e.g. Gupta and Govindarajan, 2000; Szulanski, 1996, 2000, 2003). In order to control for this effect I included a dichotomous variable that takes the value of 1 when the external source approached Europ Telco's scouting units and zero otherwise, which works as a proxy for the external source's motivation.

Geographic distance

[37] As I discuss in the robustness checks section, I also tried other operationalisations of knowledge relatedness based on industry classifications and my results remained qualitatively the same.

Previous research (e.g. Ghemawat, 2001; Hansen and Lovas, 2004; Monteiro et al., 2008) has shown that geographic distance may hinder the knowledge transfer process. I computed the geographic distance in miles between the hosting city of the source of external technology and Palo Alto, California. In order to dampen the high variability in distance and achieve a more normal distribution, the natural logarithm of the geographic distance was used in the analyses.

Tie strength

Following conventional measures (Hansen, 1999; Marsden and Campbell, 1984; Podolny and Baron, 1997), I measured the strength of the tie between the scouting unit and the recipient unit as the average of the self-reported frequency and closeness scores. Similar to Hansen (1999), I gave a work-related meaning to closeness, as opposed to the typical inter-personal affective meaning. More precisely, the lead scouter who wrote the transfer memo was asked to rate the strength of the tie between the scouting unit and the recipient unit, *prior* to the date of the transfer memo, by answering the following two questions: 1. Please indicate how frequently did you and your colleagues in the scouting unit interact with the recipient unit on average over the year prior to the introduction of this external technology (1=once a year or less; 2=once every 3-4 months, 3=once every 2nd month, 4=once a month, 5=more than once a month) and 2. Please indicate how close was the working relationship between your unit and the line of business [recipient unit] before you introduced the company [source of the external technology] to them? (1=Distant, like an arm's length relationship, 3=somewhat close, like solving and discussing issues together, 5=very close, practically like being in the same unit). Factor analysis of the two items above is consistent with them forming a single, unidimensional variable, and the scale was reliable with Cronbach Alpha = 0.90.

Scouting and recipient units' motivation

Previous research (e.g. Gupta and Govindarajan, 2000; Szulanski, 1996, 2000, 2003) has shown that the motivation of the source and recipient units may facilitate or hinder a knowledge transfer. A good proxy for the scouting and recipient units' motivation is the "potential innovation dividends" of the internalisation of the external technology. This is a key performance indicator within the studied company and it has an impact on the compensation of the managers mainly at the scouting unit but also at the recipient unit within Europ Telco. These potential innovation dividends are calculated in US$ according to a proprietary formula developed internally by Europ Telco. This is a very sensitive metric and access to the actual figures for each technology has not been provided to me by Europ Telco. Instead, it was agreed with the company that the lead scouter for the external technology would indicate in a scale 1-5 Likert scale (1=very low; 3=reasonable; 5=very high) the potential innovation dividends in terms of cost reductions and/or revenue generation due to the internalisation by Europ Telco of the external technology[38].

Additional Controls

There are multiple transfer memos written by the same scouter or sent to the same recipient unit. Therefore, I included dummy variables for each scouter and for each recipient unit in order to eliminate any spurious effects due to unobserved differences among them.

Table 6-1 below provides a summary of the measures used in this study.

[38] Given the high sensitivity of this metric, managers in the scouting units were used to report the potential innovation dividends in this kind of scale (very low to very high) even in internal documents. Not surprisingly, the correlation between the scores of the lead scouter and those of the second contact for this item was very high (0.91).

6.3. VALIDITY CHECKS

I used SAS V 9.1.3 (Hatcher, 1994; Lattin, Carroll and Green, 2003) to perform confirmatory factor analyses (CFA) to check the convergent (i.e. the degree to which specific items jointly load on their hypothesized constructs; Judge, 1993) and discriminant validity (Bollen, 1989; Judge, 1993) of our multi-item constructs of my multi-item constructs (knowledge dissonance; market provenness and tie strength). Factor loadings varied from 0.61 to 0.98 and were highly significant and corresponded to the hypothesized latent constructs. I also computed the composite reliability for all the latent variables by dividing (a) the squared sum of the individual standardised loadings by (b) the sum of the variance of their error terms and the squared sum of the individual standardised loadings (Fornell and Larcker, 1981). The composite reliability of the latent variables ranged from 0.84 to 0.91, exceeding the threshold value of 0.70 (Nunally, 1978), which suggests that the measurement model demonstrates adequate internal consistency.

My measure of tie strength is well-established in the literature and not surprisingly its two-factor solution had excellent (Lattin et al., 2003) Goodness of Fit Index (GFI) and GFI Adjusted for Degrees of Freedom (AGFI). Both indices exceeded 0.90. More interestingly, though, was to test the adequacy of the one-factor model of knowledge dissonance, which turned out to have a good fit (GFI=0.95, AGFI=0.86). In addition, the one factor solution has a better fit than plausible rival models. Akaike's information criterion (AIC; Boomsma, 2000; Hu and Bentler, 1999) was better for the one factor model than for the two- or three-factor models (AIC 1-factor=5.90; AIC 2-factors=78.15; AIC 3-factor=133.08). The one-factor model of market provenness had only an acceptable fit (GFI=0.88, AGFI=0.83) but this was better than the fit of rival models with two or three factors (AIC 1-factor=97.39; AIC 2-factors=197.20; AIC 3-factor=326.51). A comparison of standardised loadings, composite reliabilities and average variances extracted between the one-factor models of knowledge

dissonance and market provenness and plausible rival models also confirmed the superiority of the specifications presented here.

Table 6-1: Summary of Measures

Variable	Brief Description	Source
Dependent variable		
Successful Initiation	Dummy variable which takes the value of 1, if the transfer-memo was acted upon and zero otherwise	Scouting unit's archives
Independent variables		
Knowledge Dissonance	Score composed by the sum of 5 items measuring the level of dissonance between the business model underlying the external technology and the business model of the recipient unit in a 1-5 Likert scale	Survey
Market Proveness	Score composed by the sum of six dummy variables measuring whether the external technology was commercially available, whether it had customers using it and investors funding it	Rock Database
External Search	Amount of time spent by scouters in "external search" measured in 1-5 Likert scale (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time)	Survey
Matching	Dummy variable that takes the value of 1 if the transfer-memo indicates a specific area and/or manager to which the external technology is relevant and zero otherwise.	Rock Database
Internal Search	Amount of time spent by scouters in "internal search" measured in a 1-5 Likert scale (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time)	Survey
Internal Selling	Amount of time spent by scouters in "internal selling" measured in 1-5 Likert scale (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time)	Survey
Control Variables		
Knowlege Relatedness	Dummy variable which takes the value of 1 if the VEIC code of the source of the external technology was in the 1200 (Telecommunications) or 1300 (Wireless Communication) categories and 0 otherwise	Venture Economics
Tie strenght	Score of the strength of the tie between the scouting unit and the recipient unit--prior to the transfer memo date--measured in terms of frequency and closeness in a 1-5 Likert scale	Survey
Motivation of the source	Dummy variable that takes the value of 1 when the external source approached Europ Telco's scouting units and zero otherwise	Rock Database
Innovation Dividends	Potential innovation dividends measured in a 1-5 Likert scale	Survey
Source age	Number of years of the source of the external technology at the date the transfer of memo was written	Rock Database, Venture Economics
Geographic Distance (ln)	Natural logarithm of the geographic distance in miles between the hosting city of the source of external technology and Palo Alto	Rock database
Source size (ln)	Natural logarithm of the amount in USD that the source of the external technology had received in investments at the date of the transfer memo	Venture Economics
Scouter name	Dummy variable for the scouter who wrote the memo	Rock Database
Recipient unit	Dummy variable for the unit which received the memo	Scouting unit's archives

6.4. ANALYSIS TECHNIQUES

Since the dependent variable in my regression model is a binary variable, I used probit regression to test the hypotheses. Both probit models and logit models are commonly used for regressions with binary dependent variables. The choice between them is largely one of convenience and convention since the substantive results are generally indistinguishable. Economists tend to favour the normality assumption for *e* (error term) rather than the logistic distribution assumption, which is why probit models are more popular than logit in econometrics (Wooldridge, 2003: 556). My results are qualitatively the same if we use logit instead of probit.

Specifically, I used Stata 10 probit regression function with robust standard errors to counter the effects of heterocedasticity (Wooldridge, 2003).

In order to check for the effects of multicollinearity, I calculated the variance inflation factors (VIF) and none of our variables was close to the common cut-off threshold of tolerance that corresponds to a VIF above 10 (Wooldridge, 2002)[39].

In the next chapter I present the findings from this study.

[39] VIF values ranged from 1.2 to 4.7.

CHAPTER 7. QUANTITATIVE STUDY - FINDINGS

7.1. SUMMARY STATISTICS

Table 7-1 reports the summary statistics and Table 7-2 the pairwise correlations between the variables used in the analysis. Inspecting the descriptive statistics, we see that there is considerable variation in the important independent variables. The sources of the external technologies also vary widely in other characteristics such as size, age and geographic distance from the scouting unit. Inspecting Table 7-2, the low correlations between most of the independent variables suggests that collinearity is not a significant concern for analyses[40].

Table 7-1: Descriptive Statistics

	Obs	Mean	SD	Min	Max
Dependent variable					
Successful Initiation	137	0.35	0.48	0.00	1.00
Independent variables					
Knowledge Dissonance	137	14.15	3.86	6.00	24.00
Market Proveness	126	3.05	1.63	0.00	6.00
External Search	137	3.08	1.21	1.00	5.00
Matching	130	0.38	0.49	0.00	1.00
Internal Search	137	2.75	1.35	1.00	5.00
Internal Selling	137	2.69	1.31	1.00	5.00
Control variables					
Tie strength	137	6.09	2.44	2.00	10.00
Geographic distance (ln)	136	4.51	2.73	0.00	8.92
Innovation Dividends	137	2.54	1.16	1.00	5.00
Source age (years)	137	4.27	3.31	0.00	24.93
Source size (ln)	136	2.38	1.51	2.53	6.46
Knowledge Relatedness	121	0.48	0.50	0.00	1.00
Motivation Source	137	0.18	0.38	0.00	1.00

[40] As I reported above, I also calculated the Variance Inflation Factor (VIF) and it confirmed that multicollinearity is not a problem in my models.

Table 7-2: Pair wise Correlations Among Variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Successful Initiation	1.00														
2	Knowledge Dissonance	-0.51	1.00													
3	Market Proveness	0.29	-0.08	1.00												
4	Dissonance X Proveness	0.04	-0.01	-0.18	1.00											
5	External Search	0.27	-0.47	0.04	0.01	1.00										
6	Matching	0.27	-0.08	0.05	-0.04	0.08	1.00									
7	Internal Search	0.27	-0.58	0.05	0.07	0.67	0.05	1.00								
8	Internal Selling	0.55	-0.56	0.24	-0.01	0.44	0.23	0.39	1.00							
9	Tie strenght	0.23	-0.66	-0.17	-0.03	0.43	-0.14	0.64	0.32	1.00						
10	Geographic Distance (ln)	-0.27	0.13	-0.04	-0.11	-0.04	-0.07	0.09	-0.32	-0.08	1.00					
11	Innovation dividends	0.34	-0.38	0.23	0.03	0.16	0.29	0.12	0.50	0.04	-0.17	1.00				
12	Source age	0.02	0.05	0.45	-0.09	-0.11	0.10	0.15	-0.09	-0.16	0.02	0.17	1.00			
13	Source size (ln)	0.25	-0.05	0.51	-0.11	0.04	0.15	0.01	0.22	-0.12	-0.10	0.36	0.29	1.00		
14	Knowledge Relatedness	-0.06	0.03	0.03	0.00	0.05	-0.07	0.01	-0.10	-0.06	0.18	0.01	0.06	0.11	1.00	
15	Motivation Source	0.13	-0.03	0.13	0.07	-0.01	0.24	0.00	0.20	-0.17	-0.06	0.23	0.03	0.17	-0.15	1.00

Correlations above 0.17 are significant at the 5% level or better.

7.2. HYPOTHESES TESTING

In Table 7.3, I present two different probit regression models. I first present a base model only with the control variables (Model 1) and then the complete model (Model 2) including the independent variables of interest[41]. The base model (Model 1) shows positive and significant effects of tie strength, innovation dividends and source age, while geographic distance (between the scouting unit and the source of the external technology) is negative and significant. Source size and source motivation as well as knowledge relatedness are not statistically significant.

Hypotheses 1 and 2 refer to the impact of knowledge dissonance and market provenness on the chances of a successful initiation. More precisely, I posited in Hypothesis 1 that the more dissonant the external technology the lower the likelihood of a successful initiation, while Hypothesis 2 predicted that market provenness will have the opposite effect, increasing the odds of success of the initiation of the transfer. In Model 2, we see that the coefficient of knowledge dissonance is negative and significant ($p<0.001$) while that of market provenness is positive and also significant although less so ($p<0.05$). Those findings provide support to both Hypothesis 1 and Hypothesis 2.

Turning to Hypothesis 3, I predicted that market provenness mitigates the negative effect of knowledge dissonance on the likelihood of a successful initiation. In order to test this hypothesis that predicted a moderating effect, I followed the procedures described in the literature on moderating and interaction effects (Aiken and West, 1991; Baron and Kenny, 1986), including the centering of variables to prevent multicollinearity.

Model 2 indicates that the interaction term (Dissonance X Provenness) is positive, as predicted, and slightly significant ($p<0.10$). This may provide some support to Hypothesis 3.

Table 7-3: Predictors of Initiation Success.

	Model 1	Model 2
Knowledge Dissonance		-0.51***
		(0.13)
Market Proveness		0.27*
		(0.13)
Dissonance X Proveness		0.07†
		(0.03)
External Search		0.04
		(0.24)
Matching		1.14**
		(0.41)
Internal Search		0.62*
		(0.26)
Internal Selling		0.34†
		(0.18)
Knowledge Relatedness	-0.12	-0.19
	(0.28)	(0.38)
Tie strenght	0.11†	-0.17
	(0.07)	(0.12)
Geographic distance (ln)	-0.10*	-0.06
	(0.05)	(0.07)
Innovation dividends	0.60***	-0.05
	(0.16)	(0.23)
Source age (years)	0.13*	0.05
	(0.05)	(0.10)
Source size (ln)	-0.04	0.13
	(0.10)	(0.14)
Motivation Source	0.18	0.29
	(0.38)	(0.53)
_cons	-1.37*	2.36†
	(0.65)	(1.30)
N	121	109
Wald Chi2	39.64***	50.80***
Log likelihood	-60.23	-34.08
McFadden's pseudo R2	0.28	0.55

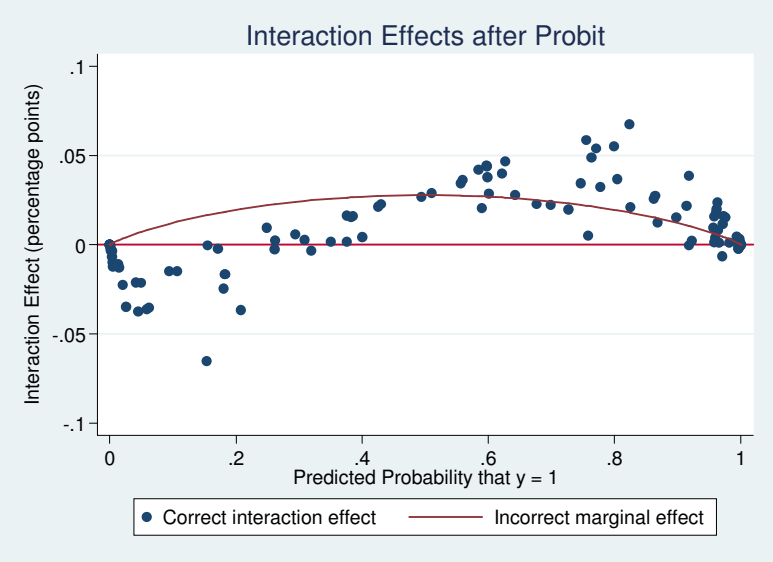
† p < 0.10, * p < 0.05; **p < 0.01, ***p<0.001. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

[41] There are some missing values in most of the variables and the sample size of each model is a result of the usable observations when considered all the variables in that specific model.

It happens, though, that the calculation and interpretation of the interaction effects in non-linear regression models like logit and probit, can be problematic and the statistical significance of the interaction effect cannot be tested with a simple *t-test* on the coefficient of the interaction term (Ai and Norton, 2003:124). The marginal effect of an interaction between two variables in a probit model is not simply the coefficient for the interaction (Hoetker, 2007:335), and the magnitude and even the sign of the marginal effect can differ across observations (Huang and Shields, 2000). Therefore, I had to generate the marginal effects for the interaction terms and I ran the "inteff" command in Stata 10 using the procedures recommended by Norton, Wang and Ai (2004). As Hoetker (2007:337) suggests, the best practice is to offer a graphical representation that provides the reader with the most complete understanding of the interaction's effect.

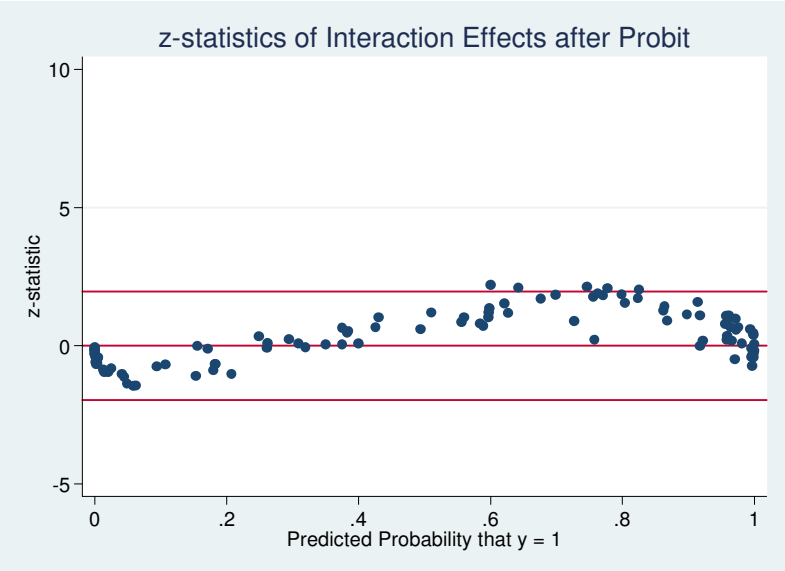
The results obtained using the "inteff" command in Stata 10 (Norton et al., 2004), confirm that for most observations the interaction term is positive, as predicted (Figure 7-1).

Figure 7-1: Interaction Effect Dissonance X Provenness (Inteff Procedure)



It also shows, however, that with the exception of a handful of observations (the dots that are slightly above the first horizontal line from top to bottom), the interaction effect is not significant (Figure 7-2).

Figure 7-2: Z-Statistics Interaction Effects (Inteff Procedure)



Thus, there is no robust empirical support for Hypothesis 3, which indicates that the moderation effect of market provenness on knowledge dissonance is not statistically significant.

Hypothesis 4 suggests that higher external search efforts are associated with a higher likelihood of a successful initiation. Model 2 indicates that the coefficient of external search has the predicted positive sign but it does not reach statistical significance. Thus, Hypothesis 4 is rejected. Hypothesis 5 and Hypothesis 6 predicted that internal search and internal selling efforts would also have a positive impact on the odds that the initiation of the technology sourcing process would be successful. Both hypotheses are supported. The coefficients of

both internal search and internal selling efforts are positive, as predicted, and significant at the 5% and 10% levels, respectively.

Finally, Hypothesis 7 predicted that the matching of the external technology to a specific manager (or team) within the focal firm would increase the odds of a successful initiation. This hypothesis is also supported ($p<0.01$). Table 7-4 below provides a summary of the findings.

Table 7-4: Summary of Results

Hypothesis	Variable	Predicted Sign	Statistical Significance
H1	Knowledge Dissonance	Negative	p<0.001
H2	Market Proveness	Positive	p<0.05
H3	Dissonance X Proveness	Positive	Not Significant
H4	External Search	Positive	Not Significant
H5	Internal Search	Positive	p<0.05
H6	Internal Selling	Positive	p<0.10
H7	Matching	Positive	p<0.01

7.3. ROBUSTNESS CHECKS

I performed several tests to check the robustness of the findings. First, it is plausible that the measure of knowledge relatedness used above did not adequately capture the technological relatedness between the external source and Europ Telco. To test the validity of my results, I created a number of alternative operationalisations of knowledge relatedness. First, I used a more nuanced measure of knowledge relatedness based on industry

classification. Instead of using a dummy variable, I created a knowledge relatedness measure that took the value of 1 if the VEIC of the external source was in the 1200 (Telecommunications) or 1300 (Wireless Communications) categories, the value of 0.5 if in other categories in the broader industry 1000 (Communication) classification and 0 otherwise. Model 3 in Appendix 9 below shows that the results remain qualitatively the same.

I also run several models using patent-based measures of knowledge relatedness, although this reduced the number of observations in the model to fewer than ninety. More specifically, Model 4 in Appendix 9 shows the results when I used a patent-based knowledge relatedness measure which was a dummy that takes the value =1, if Europ Telco and the external source had any patenting activity (either patent application or patent assigned) in the same technology sub-class at the date of the transfer memo, and zero otherwise. The results are robust to this specification as well.

Given that the significance of the interaction term in those alternative models increased in relation to the original specification, I calculated once more the marginal effects for the interaction terms and using the inteff command in Stata (Norton et al., 2004). The results are similar to the ones in the original model, showing that most observations show a positive interaction effect, although the vast majority is insignificant. See Figures 0-1, 0-2, 0-3 and 0-4 in Appendix 9. Therefore, I also failed to find support for Hypothesis 3 with these new specifications.

More importantly, I further probed the robustness of the findings by trying seven other patent-based knowledge relatedness measures. Please refer to Appendix 10 for more details on those alternative operationalisations. The results remained qualitatively the same in all those alternative models.

I also tested whether a different operationalisation of market provenness would qualitatively alter my findings. Although combining the six items that compose the market provenness variable has empirical validity, it is theoretically plausible that the item that measures whether there is another telco company buying the external technology is capturing an isomorphic pressure (e.g. DiMaggio and Powell, 1983) rather than a market provenness effect. Thus, I generated a measure of market provenness composed by all the original items, except the item "there is(are) other telco(s) buying the technology", which became a dummy on its own. Model 5 in Appendix 11 shows that the initial findings are robust. More precisely, the results indicate that the new market provenness measure is still significant, although less so ($p<0.10$) and that the introduced dummy variable is also marginally significant.

Similarly, I also tested whether the results would be robust to a different operationalisation of knowledge dissonance. Although there is no indication that the five factors that compose the knowledge dissonance measure used here do not form a single construct (quite the opposite, the scale had a good Cronbach alpha and factor analysis and CFA all point out to the adequacy of this measure), one could possibly argue that technological standards may not necessarily be a component of a business model. Therefore, I created an alternative measure of knowledge dissonance that excluded the item measuring the lack of fit in terms of technological standards which, in the new model, became a variable on its own. Model 6 in Appendix 12 shows that the results remain qualitatively the same and that the coefficient of the new variable is also negative and significant.

Another robustness check performed was to run the original model but this time excluding the interaction term (Knowledge Dissonance X Market Provenness). Model 7 in Appendix 13 indicates that the exclusion of the interaction term does not qualitatively change the initial findings. I also tested different operationalisations of matching (e.g. using only

match to person; to multiple people, to a single area or to multiple areas) and the results remained qualitatively the same.

Next, I tested whether including a control variable that takes into account the lapse of time between the date when the transfer memo was written and the date when the dependent variable was collected would change my findings. In this regard, I created a variable called (Time Lapsed) which is the number of years between the date of the transfer memo and June 01, 2007. This variable has a mean of 2.87 years, standard deviation of 0.79, a minimum of 1.54 years and a maximum of 4.39 years. As Model 8 in Appendix 14 shows, lapse although positive is not significant and the signs and levels of significance of the variables of interest in this study remain the same.

In my fieldwork, scouters reported that the fact that an external technology is patented (or has a pending patent) does not seem to affect the lines of business' predisposition to follow-up an opportunity to transfer such technology. It is plausible, however, that for many different reasons, an in-sourcing firm may prefer to act on opportunities to transfer external technologies that are not patented. Therefore, I run an alternative model where I included an additional control variable. It is a dummy that takes the value=1, if the source of the external technology had a patent or a patent application at the date of the transfer memo and zero otherwise. As Model 9 in Appendix 15 indicates the original results are robust and the new control variable does not reach any acceptable level of significance. It seems to imply that, at least in this specific context, the existence of a patent or patent application does not have a significant effect on the likelihood of a successful initiation.

There was no clear indication that there was any significant event in the economy or in the telecommunications sector in the time frame of this study that may have particularly influenced the outcome studied here. In any case, I tested whether including year dummies would have any effect in the previous results. Again, the results remained qualitatively the

same. In several cases (more precisely in 32 memos), the scouters mentioned in their memos that the source of the external technology had a unit in Europ Telco's home country. Given that it is plausible that this may positively affect the odds of a successful initiation, I run an alternative model with a dummy variable that took the value of 1 when the source of the external technology had a unit in Europ Telco's home country and zero otherwise. The coefficient of this dummy variable is positive but not significant and the original results are robust to this alternative specification.

Although I am already taking into account the amount of effort scouters spent in searching and "selling" internally the opportunity to transfer a focal external technology, I further tested the robustness of the results by including a variable corresponding to the total word count of the transfer-memo. It is plausible that the length of the transfer-memo is another good proxy for the amount of effort devoted by the scouter. It turns out that this variable is positive, as expected, but not significant. And the previous results remained qualitatively the same.

Finally, I further investigated whether the scouters were sending transfer memos of technologies in the whole spectrum in terms of knowledge dissonance and market provenness. It is plausible that they were doing the selection themselves and introducing to the business units only those opportunities to tranfer technologies that were proven and consonant. By inspecting the histograms in Appendix 16, it is clear that my sample includes a representative number of dissonant and unproven technologies.

7.4. DISCUSSION

While the qualitative study aimed at shedding light on the technology scouting *process* and on identifying some factors that may explain *why* some opportunities to transfer external technologies are acted upon while others receive no action, the primary purpose of the quantitative study was to investigate the relative impact of specific barriers and facilitators on the likelihood of a successful initiation—i.e. on the chances of an opportunity to transfer an external technology being acted upon.

Overall the findings of this study support that both the attributes of the external technology (i.e. its level of dissonance and market provenness) and process variables (i.e. the effort spent by scouters in internal searching and selling and their ability to match the external technology to a specific manager/team within the company) have a significant impact on the likelihood of a successful initiation of the external technology sourcing process. More precisely, three broad sets of insights emerge from this study.

First, I showed that the level of dissonance of an external technology negatively and significantly impacts the likelihood of it being acted upon by the recipient unit. Everything else equal, managers in the lines of business tend to neglect the opportunities to transfer external technologies that do not fit with their dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986). On the other hand, this study also provides empirical support for the importance of market provenness in increasing the odds of a successful initiation. Szulanski (1996, 2000, 2003) has shown that, within the firm, the transfer of best practices that have a proven record of past usefulness is less difficult to initiate. The results of this study reveal a similar pattern in the external knowledge sourcing process. Managers in the in-sourcing firm are more likely to act on opportunities to transfer external technologies when the latter are market proven—i.e. are commercially available and have customers and

investors. Showing that an external technology is market proven, however, not only demonstrates its past usefulness (Szulanski, 1996, 2000) but it may also provide some evidence that the source of the external technology is legitimate and reliable. Therefore, market provenness as defined and measured in this study seems to go beyond Szulanski's (1996, 2000, 2003) notion of provenness of the knowledge's usefulness. It also encompasses a market and sometimes institutional endorsement to the source of the external technology (e.g. Stuart et al., 1999). In a related vein, it is also in line with the view that organisations that have customers and investors backing it are likely to be perceived as legitimate which enhances their credibility and their likelihood to receive resources from other organisations (e.g. Parsons, 1960; Suchman, 1985).

I have also hypothesised that market provenness would mitigate the negative effect of dissonance on the likelihood of a successful initiation. In other words, I expected that the evidence that a certain external technology has been proven in the market would (at least partially) offset the cognitive blindness to opportunities to transfer external technologies that did not fit with the existing dominant logic of the recipient unit. Surprisingly, though, the interaction between market provenness and knowledge dissonance, although positive as predicted, is not statistically significant. This seems to imply that the recipient unit's "anti-bodies" to dissonant technologies are not sensitive to market-based proofs that the external technology is not only commercially available but also that it has customers and investors.

Second, my findings reveal that search effort positively impacts the odds of a successful initiation. It seems, however, that it is the "internal" search effort—the effort in identifying the roadmap of the lines of business and in understanding their requirements, needs and constraints—that really matters. Although scouters make similar efforts—in terms of time spent—in external and internal search (please refer back to Table 7-1), it is only the internal search effort that has a positive and significant effect on the likelihood of a successful

initiation. The external search's coefficient, although positive, as predicted, did not reach statistical significance. If the qualitative study had already indicated that internal search is a distinct and important stage in the external technology scouting process, the results of the quantitative study are even more intriguing. While the extant literature has focused on the externally-oriented facet of the external technology sourcing process and emphasized the importance of *accessing* external ideas and "capturing" environmental signals, this study highlights the importance of the potentially less glamorous task of spending time within the firm, searching internally for the lines of business' requirements and constraints. These results should be interpreted with caution though. The life-stage and the location of the scouting unit studied here may have had an important impact on those results. First, the period captured in my sample refers to the third to the fifth year after the establishment of the scouting unit in Silicon Valley. I would not argue that the scouting unit in Silicon Valley had already reached its maturity in that period but surely it was not in its infancy either. As I have described in the qualitative study, in the initial years subsequent to the unit's establishment in 2000, accessing the external technologies was quite challenging for the scouters. Most of the deals they analysed were originated by VCs. It is also important to recall that, as described earlier, my sample is based only on external technologies scouted in Silicon Valley. Silicon Valley is a technological cluster where the availability of external technologies; the prevalence of events (e.g. specialized conferences, industry fora), and the predisposition to share business plans with VCs and large corporations may not be equally found elsewhere. Therefore, scouters may have to spend more effort (and this effort may be more consequential to the success of the initiation of the knowledge sourcing) in other regions of the world.

Finally, the third set of insights refers to the importance of two other process-related internal activities—internal selling and matching—in increasing the likelihood of a successful initiation. This study provides empirical support for the importance of the brokering activities

performed by the scouters. Brokering here, however, does not merely mean acting as agents, negotiators or middlemen. And the brokerage activity performed by the scouters is also different from the traditional *tertius gaudens* orientation emphasized in the structural holes theory (Simmel, 1950; Burt, 1992, 2000), where the broker has an advantage by playing people off against one another for his or her own benefit. Rather, knowledge brokers translate the external knowledge (e.g. Brown and Duguid, 1991, 1998; Pawlowski and Robey, 2004) before transferring it to other units within Europ Telco. And, even after scouters have performed this translation exercise by writing the transfer-memos, they seem to have a *tertius iungens* strategic orientation (Obstfeld, 2005), where they try to close the structural hole, (between the external source and the recipient unit within the company) to coordinate action. And both the effort in internal selling and the ability to connect opportunities to transfer external technologies to specific managers within the firm facilitate the initiation of the technology sourcing process.

Interestingly the way these findings portray the initiation of the knowledge sourcing process resembles some of the mechanisms described in the literature on issue selling (e.g. Dutton and Ashford, 1993; Dutton et al. 1997; 2001; 2002). I suggest this is a very different—and arguably more realistic—description of how a knowledge transfer is initiated which should be contrasted with the conventional approach to use communication theory (e.g. Shannon and Weaver, 1963) as an overarching framework to model knowledge transfers in MNCs (e.g. Gupta and Govindarajan, 2000:475).

It should also be highlighted that the results of this study are robust to several alternative specifications for the independent variables and for knowledge relatedness, a key control variable. These results are also robust even when I included several other control variables. In addition, my fieldwork also suggests the basic validity of the propositions and results of this quantitative study. Thus, it seems fair to affirm that there are no obvious alternative

explanations that would coherently account for the hypothesized effects suggested in this paper.

This said, this study has several limitations. In the next Chapter, in addition to examining those limitations, I will also offer some concluding remarks, elaborate on the implications of this dissertation for theory and for practice and suggest some promising avenues for future research.

CHAPTER 8. DISCUSSION AND CONCLUSIONS

8.1. SUMMARY OF FINDINGS

This dissertation is aimed at developing a better understanding of how firms search and identify opportunities to transfer external technologies across geographies and of why some of those opportunities are acted upon while others receive no action. These are fundamental questions in regard to the process of sourcing external technologies that could not be answered by the existing literature, either because scholars had so far focused on a subsequent stage of the external technology sourcing process (e.g. the integration of external knowledge) or because the studies on search used a data structure (patent records) that does not (and cannot) provide the level of granularity required to unveil the complex mechanisms involved in this process.

More specifically, I addressed three research questions in this dissertation: 1) *How* do MNCs search for, identify and act upon (or fail to) opportunities to transfer external technologies across geographic boundaries?; 2) What are the barriers and facilitators that explain *why* some identified external technologies are acted upon while others receive no action? and 3) *How much* do those barriers and facilitators impact the likelihood of a successful initiation—i.e. the chances of an opportunity to transfer an external technology being acted upon?

The dissertation includes two studies: the first one examined the *process* through which large MNCs use specialised subsidiaries (viz. technology scouting units) to systematically search for opportunities to transfer technologies across geographic and organisational boundaries. And by shedding light on this process, this study also provided some novel insights into the behavioural and cognitive patterns that may explain why

some identified opportunities to transfer external knowledge receive attention and are acted upon while others are neglected and receive no action. In short, it focused on the *how* and *why* questions above. My data collection effort has extended over a 34-month period; involved more than 50 semi-structured interviews with managers in three continents; numerous field observations and the access to a proprietary database containing detailed information on 137 external technologies that were scouted by one of the largest telecommunication services providers in the world, between January 2003 and December 2005. This study has shown that technology scouting is a multi-staged process which goes much beyond external search, involving significant efforts in internal search, internal selling and matching. This implies that external technology scouting is much more than searching for external solutions; in fact, technology scouters spend a significant portion of their time trying to identify internal requirements and constraints; translating external knowledge to the company's language and matching the external solution to specific managers/teams within the firm. My findings also indicate that "market proven" external technologies are more likely to be acted upon, while external technologies that challenge the firm's dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986)—which I called dissonant knowledge—tend to be ignored.

In the second and quantitative study, I assessed the relative impact of those factors on the likelihood of an external technology being acted upon by another unit within the MNC. I examined the importance of the factors that emerged from the inductive study in facilitating (or in making more difficult) the initiation of the external technology sourcing process. If the first study addressed the *how* and *why* questions, in the quantitative study I went one step further and tested *how much* those factors impacted the likelihood of specific opportunities to transfer external technologies being acted upon. While the

qualitative study focused on the technology scouting *process*, the quantitative paper focuses on its *outcomes*.

Overall the findings of the quantitative study supported that both the characteristics of the external technology (i.e. its level of dissonance and market provenness) and process variables (i.e. the effort spent by scouters in internal searching and selling and the scouters' ability to match the external technology to a specific manager/team within the company) have a significant impact on the likelihood of a successful initiation of the external technology sourcing process. I predicted, and found empirical support, that knowledge dissonance and market provenness would have opposite effects on the likelihood of a successful initiation. If the former makes initiation more eventful, the latter facilitates it. Surprisingly, though, the interaction between those two factors (market provenness and knowledge dissonance), although positive as predicted, is not statistically significant. Therefore, the negative effect of knowledge dissonance on the odds of a successful initiation does not seem to be mitigated by the external technologies' level of market provenness. Using my informants' verbiage, the generation of "anti-bodies" to dissonant technologies takes place regardless of the market provenness the external technologies bring with them.

The findings of the quantitative study also reveal that search effort positively impacts the odds of a successful initiation. It showed, however, that it is the "internal" search effort—the effort in identifying the roadmap of the lines of business and in understanding their requirements, needs and constraints—that really matters (external search effort does not seem to significantly impact the initiation success). This is an intriguing finding which highlights the importance of the less glamorous task of spending time within the firm, searching internally for the lines of business' needs, requirements and finding out what the lines of business cannot do. Finally, the quantitative piece also

indicated the importance of two other process-related internal activities—internal selling and matching—in increasing the likelihood of a successful initiation. Scouters play an important brokerage role in manipulating the external knowledge and in connecting the external opportunities to specific managers and/or teams. In addition, the process they go through to "sell" internally the opportunities to transfer external technologies bears important resemblances with some of the mechanisms described in the literature on issue selling (e.g. Dutton and Ashford, 1993; Dutton et al. 1997; 2001; 2002).

8.2. IMPLICATIONS FOR THEORY

While previous literature helped us understand the strategic importance of accessing external knowledge (e.g. Ahuja, 2000; Chesbrough, 2003a; Katila and Ahuja, 2002; Laursen and Salter, 2006)—and the prevalence of the phenomenon—this dissertation is the first to provide a fine-grained and systematic account of an organisational process that so far had been inferred by its outcome, typically from patent data (e.g. Almeida, 1996; Katila, 2002; Rosenkopf and Almeida, 2003; Rosenkopf and Nerkar, 2001; Sorenson and Stuart, 2000; Stuart and Podolny, 1996).

This dissertation builds on and contributes to the literature on knowledge sourcing in multi-units organisations (e.g. Hansen, 1999; Hansen and Lovas, 2004; Hansen et al., 2005; Monteiro et al., 2008; Szulanski, 1996, 2000, 2003) and by refining our understanding of the different stages involved in the external technology sourcing process, this dissertation revealed a much less studied facet of this process: the challenges and the importance of the inward looking activities such as internal search, internal selling and matching. As I discuss below, this shift from the externally oriented activities to what happens within the in-sourcing firm has important implications for our understanding of possible causes for initiation stickiness (Szulanski, 1996, 2000, 2003).

More precisely, the findings in this dissertation provide a new and more nuanced comprehension of both the search and the transfer stages of knowledge sourcing (Hansen, 1999).

First, my findings show that search is bi-directional: it occurs not only where we already knew from previous literature (i.e. in the external environment) but also within the firm. Szulanski's (1996, 2000, 2003) view of initiation stickness seems to emphasize that the difficulty in recognizing opportunities to transfer is due to the difficulties in "finding" the opportunity in the environment. By disentangling internal search from external search, my findings indicated that scouters may find it even more difficult to make sense about what they should be looking for rather than "finding" the external technology once they have learned how "to position their radars". More importantly, this dissertation also indicated that, at least in certain contexts, the efforts on the internal search seem to be more consequential to a successful initiation than the amount of effort spent searching the environment for the external technologies.

In sum, the existing literature made important progress examining the externally oriented search—i.e. identifying different types of "radars" that can be used to access external knowledge, ranging from corporate venturing (e.g. Dushnitsky and Lenox, 2005; Wadhwa and Kotha, 2006) to the forming of strategic alliances (e.g. Dussauge, Garrette and Mitchell, 2000; Kale and Singh, 2007) to informal networks (e.g. Liebeskind et al., 1996). One of the contributions of this dissertation is to unveil that there is another search process in place: the internal search process where managers are trying to make sense of the internal requirements and needs so they can understand how to "position" their radars. The mere existence of this internal search somehow calls into question the implicit assumption in the existing literature that the requirements and needs necessary to start the search process are given (or easily obtainable). Rather, it reveals that scouters have

significant difficulties in identifying what are the issues they should be looking solutions for. This finding that a key challenge in the external knowledge sourcing has less to do with "global access" but with internal sense-making has important implications for our theorising on the "MNC advantage" (e.g. Doz et al., 2001). If on the one hand MNCs's size and global presence may be beneficial in providing *access* to more sources of external knowledge on a global basis, on the other, such characteristics exacerbate the internal challenges involved in the initiation of the external knowledge process.

It is also worth emphasising that the findings in this dissertation provide an angle on the *transfer* stage that is quite different—and potentially closer to the actual behaviour of identifiable firms (Argote and Greve, 2007)—from the classic communication theory (e.g. Shannon and Weaver, 1963) metaphor to modelling knowledge transfers in MNCs (e.g. Gupta and Govindarajan, 2000:475). My informants' description of how they have to manipulate the external knowledge (e.g. Pawlowski and Robey, 2004) before transferring it to other units within the firm, in a process of translation which involves framing the elements of one community's world view in terms of another community's world view (e.g. Brown and Duguid, 1991; Pawlowski and Robey, 2004; Wenger, 1998) clearly indicate that "scouting" goes beyond its literal definition, as scouters do much more than "reconnoitring the external environment for the purpose of making discoveries or acquiring information".

It may not sound novel to affirm that scouters are also knowledge brokers. More interestingly, though, this dissertation shows that scouters are brokers with a *tertius iungens strategic* orientation (Obstfeld, 2005). Unlike the classic *tertius gaudens* orientation emphasized in the structural holes theory (Simmel, 1950; Burt, 1992, 2000), technology scouters do not play people off against one another for his or her own benefit. Instead, my findings about the internal selling and matching processes provide some

initial evidence that scouters are brokers who close the structural hole (between the external source and the recipient unit within the company) to coordinate action.

Another interesting insight about the transfer process is the fact that scouting units—as often is the case of many subsidiaries within a MNC—do not to have a mandate (Birkinshaw, 1996; Birkinshaw and Hood, 1998) to force other units to act on the opportunities they find. In other words, action on an opportunity to transfer an external technology is not imposed but negotiated. Not surprisingly, the findings from the qualitative study indicated that informants see the transfer as "internal selling". In a related vein, the amount of effort scouters spent in internal selling was found to have a positive and significant effect on the odds of a successful initiation. These results taken together seem to indicate that our theorising about (internal and external) knowledge sourcing processes can—and probably should—be more informed by the literature on issue selling (e.g. Dutton and Ashford, 1993; Dutton et al. 1997; 2001; 2002).

I have thus far emphasised the theoretical implications that derive from the fine-grained understanding of the different stages involved in the initiation of the external technology sourcing process. Another key contribution of this dissertation, though, is the identification (in the inductive study) of market provenness and knowledge dissonance as two new attributes that impact (as shown in the quantitative study) the likelihood of an opportunity to transfer an external technology being acted upon. The observation of—and theorising about —this first selection point (some opportunities will be picked up while most will be neglected) in the external knowledge sourcing process has very important theoretical implications.

First, I found empirical support that market provenness—i.e. the extent to which an external technology has been proven in the market in terms of being commercially available, having customers and investors—do increase the likelihood of a successful

initiation. Market provenness extends to the *external* knowledge sourcing process what Szulanski (1996, 2000, 2003), in the context of intra-firm knowledge sharing, labelled knowledge provenness. The initiation of the transfer of best practices within a firm is easier when those best practices have a proven record of past usefulness (Szulanski, 1996, 2000). This dissertation refines this concept and provides a conceptual and empirical notion of provenness that goes beyond the idea of provenness merely in terms of the knowledge's usefulness (Szulanski, 1996, 2000, 2003). Here more than proven in the purely cognitive sense, market provenness encompasses a market and institutional endorsement to the source of the external technology (e.g. Stuart et al., 1999). It is consistent with the view that organisations that have customers and investors backing it are likely to be perceived as legitimate which enhances the organisation's credibility and its likelihood to receive resources from other organisations (Parsons, 1960; Suchman, 1985).

In addition to providing a richer, more sociologically informed measure of provenness, this dissertation also provides some initial insights into the underlying mechanisms that may explain why and how market provenness facilitates the internalisation of an external technology. My fieldwork indicated that managers in the lines of business may feel more assured by the fact that the external technology has already been adopted by the market and that there is a "group of intelligent people somewhere ready to put their money where their mouth is and fund the [external] company", and therefore they may be more confident to import that technology "as it is" and launch new products or services based on it. Eventually, the in-sourcing firm can become more innovative than it would otherwise be just by internalising external technologies that have been market proven.

Now contrast this with the most well-established line of thinking in the existing literature on how external knowledge leads to higher innovation performance. This body of literature, builds on evolutionary economics arguments (e.g. March, 1991; Nelson and Winter, 1992), to suggest that a firm which engages in accessing external knowledge is better able to innovate because it can add distinctive new knowledge variations which provide a wide enough range of choices to solve a new problem (e.g. Fleming and Sorenson, 2001; Katila and Ahuja, 2002; Rosenkopf and Nerkar, 2001). Several empirical studies support this line of argument (e.g. Henderson and Cockburn, 1994; Katila, 2002; Katila and Ahuja, 2002; Rosenkopf and Nerkar; 2001).

The internalisation of market proven external technologies may increase the innovation performance of the in-sourcing firm without necessarily involving any knowledge recombination. In other words, this seems to be another mechanism that may explain the positive relationship between external knowledge sourcing and innovation performance. This may have important implications to the stream of research examining the relationship between external knowledge sourcing and innovation performance (e.g. Laursen and Salter, 2006; Rosenkopf and Nerkar, 2001). I should obviously caveat that this dissertation, given its focus on the initiation, does not provide robust findings on the role of market provenness in the subsequent stages of the knowledge sourcing process. I only provide anecdotal evidence that market provenness may be an important factor in the final internalisation of an external technology. This said, as limited as these initial insights can be, they start to reveal the potential benefits of opening the external knowledge sourcing process "black box" and of trying to directly observe the underlying mechanisms at play.

Last but certainly not least, a (if not "the") key theoretical contribution of this dissertation is the identification and conceptualisation of a new knowledge dimension.

My fieldwork revealed that some external technologies went against the "commercial or technological convictions" of the recipient unit. At the heart of this knowledge dimension is the idea of "lack of agreement" rather than "lack of understanding", which seems to be the focus of knowledge relatedness (Hansen, 2002). Interestingly, the existing literature has acknowledged the potential existence of this lack of agreement between external knowledge and an existing knowledge base. More precisely, Schulz (2003) clearly admits that external knowledge may *contradict* local-knowledge. He conflates, however, in a single knowledge dimension—knowledge relevance—external knowledge that elaborates or strengthens with knowledge that contradicts local-knowledge (Schulz, 2003:444). Thus, one contribution of this dissertation is to conceptualise (and to operationalise) this new knowledge dimension—which I called knowledge dissonance—and to show that its theoretical roots can be traced to Festinger's (1957) theory of cognitive dissonance.

More importantly, I have also empirically shown that opportunities to transfer dissonant external technologies are less likely to be acted upon than those consonant opportunities that confirm the recipient unit's dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986).

These findings contribute to a better understanding of the role of managerial cognition in managing technological change (e.g. Barr, Sitmpert and Huff, 1992, Garud and Rappa, 1994; Kaplan, Murray and Henderson, 2003; Kaplan, forthcoming; Kaplan and Tripsas, forthcoming; Tripsas and Gavetti, 2000). There are already several accounts of how organisations are subject to strong inertial forces (e.g. Hannan and Freeman, 1984) but most studies examined this issue from a political angle, showing how the pursuit of interests by individuals or groups of tends to maintain the *status quo* (e.g. Bower, 1970; Bower and Doz, 1979; Burgelman, 1994, Christensen and Bower, 1996).

More recently, some scholars (e.g. Kaplan, forthcoming; Kaplan and Tripsas, forthcoming) have been emphasising how managerial cognition plays an important role in organisational inertia. Kaplan (forthcoming) for instance, argues that managers' cognitive frames are a natural mechanism to connect ambiguities created by discontinuities to strategic choice. Therefore frames filter managers' perceptions about what is happening and what action should be taken (Daft and Weick, 1984; Hambrick and Mason, 1984).

This dissertation is another contribution to this increasingly important research stream. And, it examines the role of managers' cognition at a stage that so far had not received much scholarly attention: the initiation of the external knowledge sourcing process. It is worth highlighting that at this very initial stage, the managers are faced with a relatively simple decision: whether to follow up an opportunity to transfer an external technology or not. Basically, the only resource to be allocated by managers (Bower, 1970), at that stage, is their attention (and time). And, even, in that phase, cognition plays an important role: managers are unlikely to allocate their attention to opportunities that challenge their dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986). This finding has important implications for our understanding of how organisations deal with technological change as it may indicate that inertial forces may kick in much earlier than previously thought. In other words, dissonant technologies may be selected out well before they are brought for investment consideration during the resource allocation process (Bower, 1970).

My results call out a paradox: even when a MNC purposefully establishes a scouting unit thousands of miles from its headquarters to overcome local search, the selection biases may be so strong that it ends up paying attention only to opportunities that fit with their existing dominant logic (Bettis and Prahalad, 1995; Prahalad and Bettis, 1986). This seems to resonate with Criscuolo and Narula (2007) recent study about the

challenges faced by MNCs which, in response to globalisation, are adopting multi-hub structures for international R&D. Similar to my findings, Criscuolo and Narula (2007:5) found that those MNCs are subject to strong inertial forces (Hannan and Freeman, 1984) and the authors highlighted that "while organisational structures are relatively easy to change—implementing these challenges systematically through an organisation often requires fundamental changes in the institutions that make organisational structures efficient" and those institutions—especially informal ones—evolve only gradually over time.

8.3. IMPLICATIONS FOR PRACTICE

Ever since the early 2000s, there has been a number of managerial articles suggesting that companies should increasingly import new knowledge and expertise through different forms of R&D collaborations (e.g. Linder, Jarvenpaa and Davenport, 2003; Rigby and Zook, 2002; Quinn, 2000). Chesbrough (2003a) popularised these ideas in his book "*Open Innovation: The New Imperative for Creating and Profiting From Technology"*, where he argued that Open Innovation "is a paradigm shift in how companies innovate and commercialise industrial knowledge".

This dissertation provides a detailed account of how MNCs embrace this "open innovation" approach by establishing technology scouting units in knowledge clusters like Silicon Valley. A number of important implications for practice can be derived from this manuscript.

First, it shows that the way the scouting function is established may have important consequences. For instance, instead of merely establishing a scouting unit in Silicon Valley, Europ Telco initially also created a stand-alone venture fund. And bringing financial resources to the table and thus partnering with high status local venture

capitalists enabled Europ Telco's managers to tap in to the tight knit network in Silicon Valley. In those early days in Silicon Valley, the Europ Telco's scouters relied on those VCs to arrange the majority of their meetings with start-ups. Over time, the importance of having those funds decreased considerably but having those funds available in the first place was essential to enable a successful entry. In sum, with a relatively small investment, Europ Telco managed to get access to hundreds external technologies per year. As much as I should caveat that normative implications from a single case should be derived with extreme caution, managers in MNCs considering making knowledge seeking foreign direct investments should carefully examine the best way of establishing a scouting unit in a specific region. It is likely that access to the best external technologies may not be immediate, unless this is done in partnership with local players (e.g. local VCs). After getting embedded in the local network, though, scouters managed to keep a good deal flow by just attending and presenting in conferences, reviewing portfolios with VCs, organizing industry fora, with no immediate need to make investments.

Ironically, though, having access to the external technologies per se ended up not being the bottleneck for the scouters. Instead, an important managerial implication of the findings of this dissertation is that the nature of the key challenge in the external knowledge sourcing process may be internal. It is interesting to compare these findings with practical wisdom. Typically, technology scouting brings to our minds the idea of being externally connected, participating in conferences, having "radars" to capture the signals from the external environment. For many managers (including some managers at Europ Telco's headquarters) scouters spend their day in glamorous external activities, "hanging around with the entrepreneurs and VCs in sunny California". The picture that I witnessed was quite different though. If it is true that scouters usually spent many afternoons outside the office, they typically spent all their mornings (giving the time

difference, that was the working time in Europe) connecting to people *within* Europ Telco. On top of that, the time spent by the Senior Vice President responsible for all scouting units travelling back to Europ Telco's headquarters in Europe was impressive. He crossed the Atlantic about once every two months for a week, which was a significant investment of his time. He normally scheduled anywhere between 15-20 meetings in that week. In sum, even for highly experienced managers (please refer back to the bios of the scouters) identifying internally the "book of pain points" was not trivial.

This implies that for MNCs planning to establish scouting units, it is important to bear in mind that it is unlikely that the rest of the organisation will voluntarily and effortlessly disclose their problems and constraints so the scouters can make sense of what they should be looking for. Extracting these "pain points" is costly (at a minimum in terms of time). In a similar vein, scouters played an important role of translating what they see in the external environment to the focal firm's language. In addition, it was very important that scouters are able to match the external technology to specific person(s) within the organisation. Therefore, in the resource allocation process, managers should carefully take into account the amount of time they will allocate to scouters to perform all these internal activities vis-à-vis the external activities. This becomes even more relevant if we consider that the internal activities (more than the effort spent in the external environment) seem to positively influence the odds of a successful initiation.

Corporate managers should also consider the importance of these internal activities when deciding about the profile and the skill set necessary to perform the scouting function. In my fieldwork, I heard numerous anecdotes of how external consultants, regardless of how well connected they could be in the local community (i.e. with local VCs and start-ups), had difficulties in performing all the internally-oriented tasks involved in the scouting process. For instance, Europ Telco tried to use in the past

external consultants as scouters in Israel, unsuccessfully though, as this quote from the Head of the scouting units describes: “we were spending hours and hours on the phone trying to brief them [external consultants] about what we were looking for, and they couldn’t understand that we didn’t have a precise list of things, a shopping list for them”. Similarly, there was widespread agreement both among scouters and lines of business’ managers that the scouting function was not for novices in the firm.

Another point to be taken into consideration is that establishing scouting units ultimately does not guarantee that a MNC will be able to bring inside new ideas or act on weak signals that challenge its existing business models let alone those that have the potential of disrupting its industry. My findings show that although scouters do seem to capture and present to other units a wide range of opportunities to transfer external technologies (please refer back to Appendix 16), managers in the lines of business tend to disregard those opportunities that challenge the way they view and/or commercialise a specific technology. And, as the scouting unit technically does not have a “route to market”, this may generate a frustrating—and rather common—situation for the scouters who are largely impotent to act on the opportunities they are seeing. Or, as one of my informants metaphorically explained: *“I feel I am a hunting dog in the forest but I need someone with a gun to shoot the prey”*.

There may be at least two ways of dealing with this impasse. The first one requires the top management team to open a direct channel with the scouting units. This way scouters can potentially flag out to the very senior management team those opportunities they feel cannot be missed but which are not receiving any attention from the lines of business. Given that attention is probably the top management team’s scarcest resource, this can work only if scouters are very parsimonious in utilising this privileged channel. Second, scouters can be given resources to follow-up, at least to a certain point,

those opportunities that they really believe are promising but that no one within the organisation is prepared to follow-up. This was an option that Europ Telco was considering seriously by the end of my data collection.

The findings of this dissertation also have implications for managers in start-ups firms willing to collaborate with large firms. Those managers would probably benefit if they understand the intricacies involved in the internal processes of large MNCs, like Europ Telco. For example, knowing the importance of translation and matching, start-ups talking to large firms may wish to focus down to the sharp end of the needle, the one area of their proposition that is very clearly aligned with the large firm's problem set, instead of having a shotgun proposition where they say all the things they can possibly do. In addition, being aware of how knowledge dissonance diminishes the odds of a successful initiation, managers in start-up firms should examine how they can diminish the disagreement between their business model and the one of the large firm, assuming that doing business with the large firm is really important for them. Diminishing the level of dissonance may involve substantial changes in the start-up's business model (e.g. changing the market segment served) and may not be feasible. It is possible, however, that by simply reframing how they describe their business model may diminish the perception of dissonance and therefore increase the chances of a successful initiation.

In sum, this dissertation provides managers with a vivid illustration of how firms can embrace an open innovation strategy. At the same time, it also unveils the challenges involved in such strategy and, as I have argued elsewhere, "notwithstanding its putative benefits, open innovation is not—and can not be—a panacea for a firm seeking to develop a more effective innovation strategy" (Monteiro, Birkinshaw and Mol, 2007:2).

8.4. LIMITATIONS AND FUTURE RESEARCH

8.4.1. Generalisability

Notwithstanding the robustness of the results across models and the lack of obvious symptoms of biases, I can identify some limitations of this study that should be borne in mind.

Given that the findings in this dissertation are based on observations coming from only one company, there are several limitations on generalising the results to other settings. As Eisenhardt (1989:547) suggested one weakness of building theory from a case study is that this theory may describe a very idiosyncratic phenomenon. In a related vein, Voss et al. (2001:201) argued that single case studies have important limitations notably the limits to the generalisability of the conclusions, models or theory which are all deriving from one specific case study. Leonard-Barton (1990:250) explained that a single case study is subject to limits in generalisability and a number of potential biases, such as the misjudgement of the representativeness of a single event, exaggerating the salience of data because of its availability or even biasing estimates because of unconscious anchoring.

These are all important generic limitations that should be borne in mind when extending the findings of this dissertation to other settings. In addition, there are a number of specific limitations that need to be considered in terms of the generalisability of my findings.

First, I focused on the formal process of search for external technologies, which represented a very important mode of accessing external knowledge in the company in this study. Informal mechanisms and employee mobility may be more important in other settings (e.g. Almeida and Kogut, 1999; Rosenkopf and Almeida, 2003). In general, it is

possible that the process described here is mostly valid in large organisations where resources are more likely to be formally allocated to the external technology scouting function. It is probably not applicable to the way start-ups (and possibly small) firms go about accessing technologies across organisational boundaries.

My technology scouting perspective also assumes that scouting units and the lines of business are not geographically co-located. Some companies may have formally separate scouting units but in the same geographic area of the lines of business. In those cases, I expect that that the internal search efforts may not have the same impact on the likelihood of a successful initiation as is the case in this study.

As discussed in Chapter 1, most firms today have some interest in (and need to) accessing external technologies. It is also true, however, that the company studied here, as well other incumbents in the telecommunication services providers industry, faced a level of competition and convergence that made it more propend to accessing external technologies. More importantly, incumbents like Europ Telco were under constant pressure to reconsider their business models given that their traditional source of revenues (fixed line calls) was in clear decline (please refer back to Chapter 2). Therefore, results are biased toward successful initiations in a company which was pressured to bring external ideas inside and to change its business model.

This bias is likely to be in a conservative direction though. This is to say that even in this organisation which was highly open (by choice, by necessity or both) to internalising external technologies and which was pressured to reconsider its business model, only a fraction of the opportunities to transfer external technologies was acted upon, being knowledge dissonance a factor that significantly decreased the likelihood of a successful initiation. In other companies in less competitive and/or more stable industries, where sourcing external technologies is less necessary, a successful initiation may be even rarer,

notably in the cases where the opportunities to transfer the external technology do not fit with the companies' business models.

Another limitation on generalisation has to do with the fact that although I have interviewed the scouters in China and Japan/Korea and that the 137 technologies in my sample come from many different locations (please refer back to Figure 4.4), they were all identified in Silicon Valley. As I have indicated above, Silicon Valley is a technological cluster where the availability of external technologies; the prevalence of events (e.g. specialized conferences, industry fora), and the predisposition to share business plans with VCs and large corporations may not be equally found elsewhere. This may have implications as to the intensity of external search efforts scouters have to make (and the consequences of those efforts) in other parts of the world.

A final limitation on generalisation, the telecommunication services providers industry is, to a large extent, characterized by the fact that most players in the industry tend to rely heavily on their home country markets more than on any foreign market. On top of that, for most end consumers it is difficult to assess whether the technology that is behind a specific service offered by a telco is different from that of its competitors. Those two factors combined seem to indicate that in this industry the fact that an external technology has already been adopted by another company (even if that company is a competitor) may not be seen as a disadvantage. Therefore, while the importance of market provenness seems to generalise well to other players in the same industry as the studied company, and probably to other industries with similar characteristics, it may not have the same effect (in fact it may even have the opposite effect) in different industries (e.g. pharmaceuticals) where competition operates on a global basis and where being the first one to access and use a specific technology may be crucial.

8.4.2. Other limitations

My focus has been on uncovering the initiation (Szulanski, 1996, 2000, 2003) of the external technology sourcing process and on explaining why some of the identified opportunities are acted upon while others receive no action. This is an appropriate stage to study given that it is a necessary, although not sufficient, condition for the success of the external knowledge sourcing process as whole. However, the factors that I identified as significantly impacting the success of the initiation stage may not necessarily be the same that will affect the success in later stages of the sourcing process (e.g. integration). In other words, successful initiation literally means success in the initiation stage—i.e. an opportunity to transfer an external technology has been acted upon—with no necessary connotation that a successful initiation implies a successful internalisation of the external technology. Thus, with the data presented in this dissertation, it is not possible to predict whether (and which) factors that affected the likelihood of a successful initiation (Szulanski, 1996, 2000, 2003) will also have an impact on the subsequent stages of the in-sourcing process. Although it is very likely (and there was anecdotal evidence in that regard) that only a sub-set of the opportunities that have been acted upon will eventually be internalised, it is not possible to infer from my findings when, how and why the next selection(s) will take place.

More importantly, my data does not allow me to directly conclude that acting on certain opportunities to transfer external technologies is more or less beneficial to the in-sourcing firm than acting on other types of opportunities. For instance, my findings indicate that opportunities to transfer dissonant external technologies are less likely to be acted upon. I do not have data that enable me to *directly* infer that this is good or bad for the in-sourcing firm though. If one assumes, however, that the environment is dynamic, with frequent and rapid changes in technology, customer preferences and competition—

and all of these are plausible assumptions—it seems appropriate to affirm that acting only on opportunities that confirm the existing dominant logic at best refines exploitation (March, 1991). This can provide the in-sourcing firm with a "first-order competence", which in a first moment can be a distinctive competence and generate a competitive advantage but the risk is that it may lead firms to develop "core rigidities" (Leonard-Barton, 1995) or fall into "competency traps" (Levitt and March, 1988). A similar logic can possibly be applied to market proven technologies. If the in-sourcing firm is more inclined to act on opportunities to transfer market proven technologies it is likely to be favouring again exploitation (March, 1991). These are, however, only conjectures whose validity would depend on a number of assumptions. Therefore, the findings from this dissertation do not allow me to derive robust innovation or firm performance implications.

In a nutshell, this study has several limitations. Some of these are related to the boundary specification of my proposed approach (e.g. it is mostly applicable in large multi-units organisations where the search for external technologies is formalised) while other limitations concern my exclusive focus on only one stage of the external knowledge sourcing process (i.e. the initiation stage). Care should be taken in generalising the results to other settings; in extending them to other stages of the external knowledge sourcing process and in deriving any performance implication. These limitations narrow the scope of my perspective. With this in mind, let me now elaborate on how future research can build on and extend this dissertation.

8.4.3. Future research

First, a promising avenue would be to examine the decision processes that explain why some identified external technologies end up being internalised while others are

selected out. After initiation, what are the stages where these selections take place? Similar to Szulanski's work on the transfer of best practices within the firm (1996, 2000, 2003), future research could investigate what explains selection at different stages of the external technology sourcing process and whether (and which) factors that affected the likelihood of a successful initiation also had an impact on subsequent stages of the in-sourcing process. This may allow researchers to develop an evolutionary model of the technology scouting process. Although there are a number of evolutionary models pitched both at the industry (organisational ecology) and at the intra-firm levels (e.g. Burgelman, 1983, 1991; Lovas and Ghoshal, 2000), modelling external knowledge flows into the firm as an evolutionary process and shedding light on the (externally induced) variation and (internal) selection mechanisms involved remains to be explored. In addition, examining the whole process, its selection criteria and stages, and its final outcome may enable researchers to uncover the real mechanisms behind the association between external knowledge sourcing and innovation performance.

Second, it would be desirable if future research could provide a more in-depth comparison of how external technology scouting takes place in different parts of the world and examine how host country factors (e.g. innovation systems) affect this process. In a similar vein, future research could examine technology scouting from the team level perspective and examine how team composition and the proportion of locals and cosmopolitans (e.g. Haas, 2005; 2006a, 2006b) play a role in the external knowledge sourcing process.

Third, in the future, researchers could compare technology scouting with other modes of accessing external technology. More precisely, while many studies have already compared equity versus non-equity alliances in general (e.g. Reuer and Arino, 2002), a study providing a systematic analysis contrasting the types of external knowledge that get

accessed and eventually internalised via technology scouting vis-à-vis corporate venturing is yet to be done.

Finally, this dissertation suggested that external technology scouting is another mode of knowledge-seeking foreign direct investment (FDI) that some MNCs are exploring. Given the increasing importance of MNCs from emerging markets and the scarcity of scholarly research about their knowledge seeking FDI strategies, examining whether, how, why and under which circumstances those MNCs are using technology scouting units seems to a promising avenue for future research.

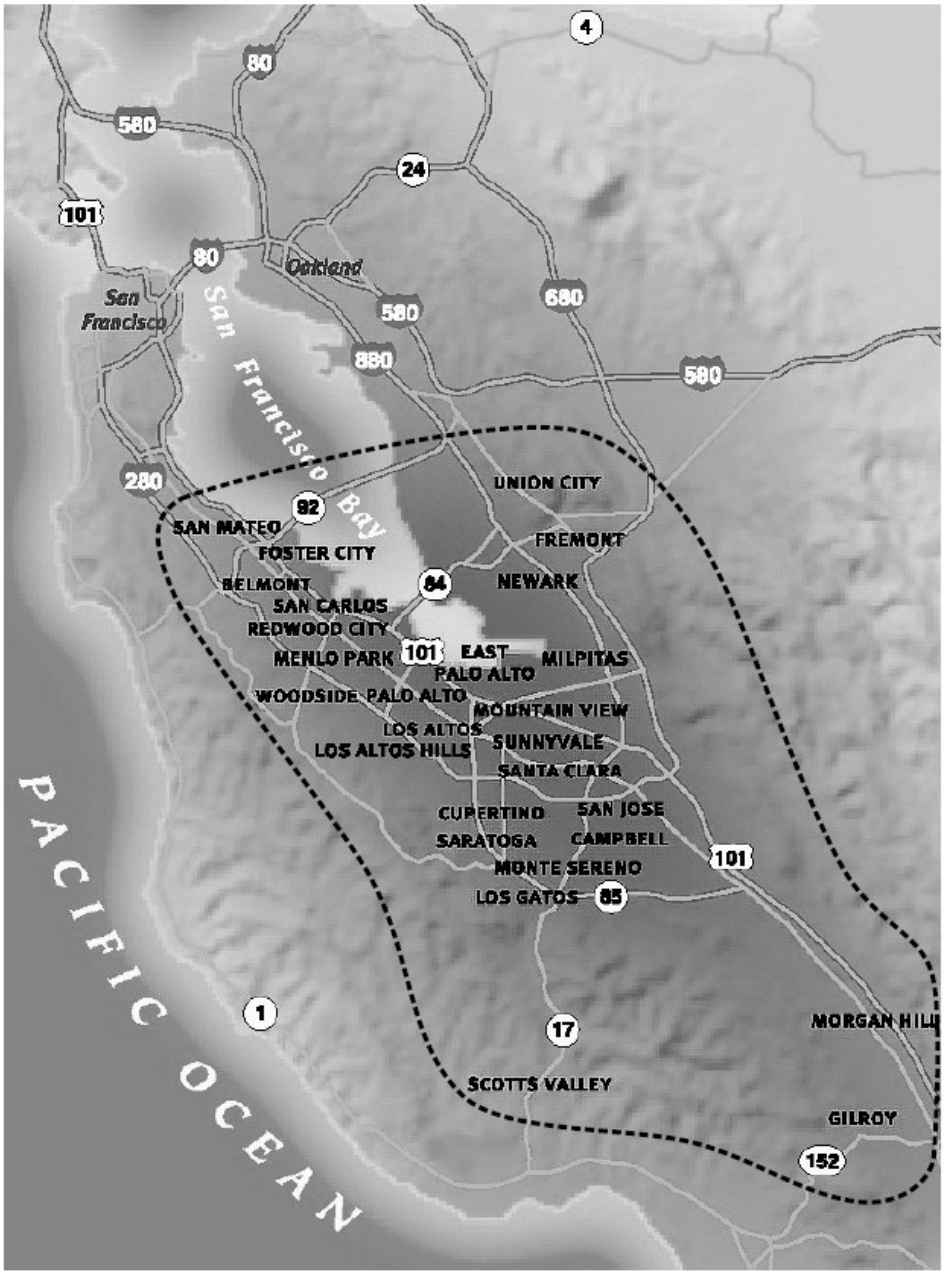
8.5. CONCLUSIONS

To conclude, this dissertation provided a fresh look at the challenges involved in the initiation of the external technology sourcing process. The process through which large multinational firms search for, recognise and act upon (or fail to) opportunities to transfer technologies across geographic and organisational boundaries tends to be highly complex and its success is a necessary, although not sufficient, condition for the incorporation of external knowledge into a focal firm's knowledge base. This dissertation is a first attempt to uncover this key organisational process that so far has mostly been inferred by its outcome, typically from patent data.

I proposed that as much as technology scouting is (internal and external) search and transfer, it is also translation, selling and matching. In addition, by uncovering this very initial phase in the external knowledge sourcing process, I provided some novel insights on why some opportunities to transfer external technologies may be more easily recognised and acted upon. More precisely, this dissertation showed that "market proven" external technologies are more likely to be acted upon, while dissonant external

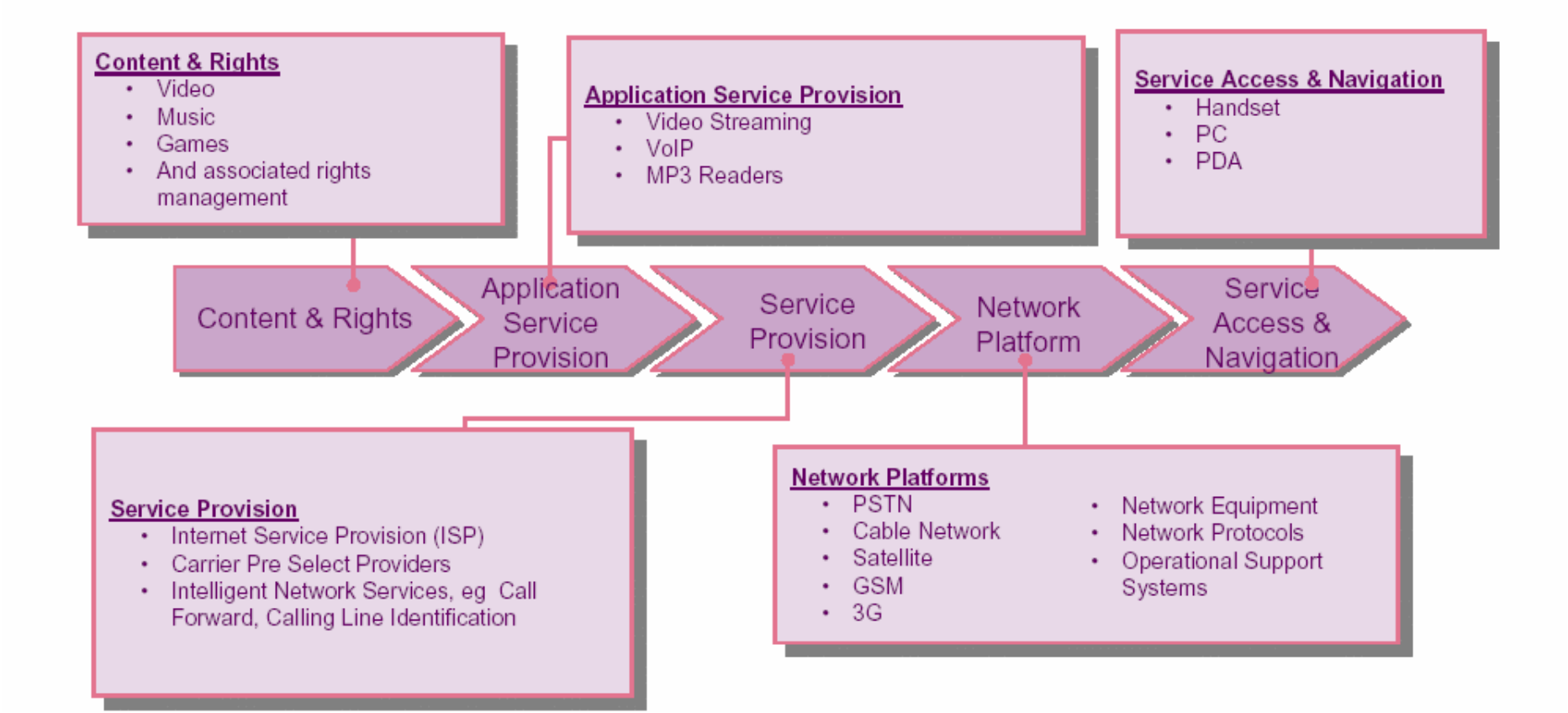
technologies tend to be ignored. For MNCs concerned about how they can scout the globe for new technologies, understanding the stages and patterns involved in the initiation of this process is a real priority, and should therefore be the focus of far more attention than it has received to date.

APPENDIX 1 – A MAP OF SILICON VALLEY



Source: Zhang (2003:2)

APPENDIX 2 – TELECOMS VALUE CHAIN



Source: Ofcom, available through http://www.ofcom.org.uk/media/speeches/2005/03/fmc2005.pdf

APPENDIX 3 – SAMPLE LETTER PILOT STUDY

London, November 14, 2004

John Smith
Director of External Innovation
ABC Telecom

Dear John

Further to our discussions during the Discontinuous Innovation Forum held at London Business School last June, please see below a brief description of a new study we are conducting that may be of interest. The focus of this research project is on how companies gather and act on external technologies.

In this first phase of the research, we are conducting research interviews in 4-6 firms to make sense of the processes they use to identify and act on new technology insights. For example, your Californian scouting units represent one useful model for tapping into new technologies and there are obviously plenty of other approaches as well. This research will be done through a series of interviews with senior managers responsible for the overall innovation process at the company's headquarters, research labs, scouting units.

The output of this phase of our study will be a report containing a comparative analysis of the practices used by the participating firms (while also adhering to any confidentiality issues you may have). We also plan to undertake a more extensive second-phase of research in the new year, which we would of course share with you as well.

We look forward to having a chance to discuss this research project with you, at your earliest convenience.

Yours sincerely,

Felipe Monteiro
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Julian Birkinshaw
Professor of Strategic and International Mgmt.
Fellow of the Advanced Institute for
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APPENDIX 4 – BIOS OF EUROP TELCO'S SCOUTERS

Pierre Daudon, Senior Vice-President, Technology and Innovation. Until June 2000 when he became responsible for Europ Telco's unit in Silicon Valley, he was Director, Internet and Multimedia for Europ Telco, based in Paris, where he managed the company's development in Internet & Multimedia. Pierre graduated in 1986 from the French Ecole d'Ingénieurs, the « Institut National des Télécommunications » and worked for other key players in the telecommunications industry before joining Europe Telco in 1991. Pierre has held a wide range of sales, marketing and management responsibilities during the course of his 21-year career in the world of telecommunications. In 2007, he headed all Europ Telco's scouting units worldwide.
John Rugby, Vice-President, Business Development for the Technology and Innovation team, joined the Silicon Valley unit in 2000 with Pierre Daudon. He was one of the authors of Europ Telco's external venturing strategy in the late 1990s and played a major role in the valuation of innovative technologies and propositions with a view to their strategic fit within Europ Telco. John worked in Europ Telco's Group Strategy and Development Department for 15 months being heavily involved with the company's strategy on Application Service Provision. Immediately before this, he was Head of Marketing and Business Development for one of Europ Telco's major business units where he had had a number of sales and marketing roles over a period of 10 years. John has a Master's Degree in Electronic Systems Engineering.
Jans Cuypera, VP Technology joined Europ Telco's Technology and Innovation team based in Silicon Valley at the beginning of 2003 and in 2005 became responsible for covering the Israeli market. Jens made his first foray into the start-up world, as Director, Business Development at a start up called Gulatz. Before joining Gulatz, Jans held various positions within Europ Telco's Technology Strategy. Jans joined Europ Telco in 1985. He obtained a Masters Degree in Telecommunications Engineering in 1998.
Marco Barbeto is VP Technology in Europ Telco's Silicon Valley scouting unit. Marco was a Senior Consultant in Europ Telco's Global Services division selling Mobility (Data on the move) Solutions in Europe. Prior to joining Europ Telco Mark spent two years in key marketing and engineering roles in a UK based start-up YTE.

Philip Cordes, Director Global Scouting Operations, and joined Europ Telco in 1999, and the scouting team in Silicon Valley in 2005. His previous roles include major customer account management and executive business support functions, in addition to having worked directly with Europ Telco's Group Chief Technology Officer. Philip holds a post graduate degree from Sheffield Hallam University.
Masaaki Nomita,Vice President, Technology & Innovation, based in Tokyo, held a number of senior positions as a Programme Director for Europ Telco's research labs. In his previous assignment in Tokyo, he was the Head of Technology in Europ Telco's Japan for over 2 years. He joined Europ Telco in 1982 after graduating from a top European university with an MSc in Microwave Engineering and Modern Optics.
Zhou Fan, Vice President, Greater China Region, based in Beijing, has vast business experience in Asia, having worked for China National Technical Import & Export Corp and a leading European bank in Singapore, before joining Europ Telco in 1999 as a Project Director – International Development Asia Pacific. He has a Bachelor Degree of Economics from Nan Kai University in China, a MBA from Asia Institute of Technology in Thailand and a MSc. in Telecom Business from University of London in the UK.

APPENDIX 5 – INTERVIEW GUIDE – FIRST ROUND OF INTERVIEWS

I) Scouting Unit's Background

1. How do you define the unit? How is it known within the company?
2. When was it established?
3. What was the motivation for opening the unit?
4. How many full time employees are there in the unit? Any part-time? If so, what are the activities of those employees when they are not working for your unit?
5. How is the unit financed (corporate money, R&D, business units)?
6. What is the unit's annual budget?
7. How is the unit's performance evaluated? What are the key performance indicators used?
8. Does the unit have specific objectives? Which? Are they formalised (i.e. written)?
9. What is the reporting relationship to the corporate parent?
10. What is the primary geographical location of your unit? Does your unit have your own people in other locations? If so, where? What is their role?
11. Could you describe what are the main activities performed by your unit? How would you rank those activities in terms of time spent by you and your employees? How would you rank them by order of strategic importance?
12. Have your unit's activities changed since it was established? How?
13. How many external technologies has your unit evaluated last year? How many of them were transferred? Out of these, how many generated some action from the recipient?

II) Informant's background

1. What is your academic background?
2. What is your work experience, if any, before joining the company?
3. When did you join the company? Where and in which positions have you worked before you joined the scouting unit?
4. When did you join the scouting unit?
5. How was the process of joining the scouting unit (i.e was it your choice, why, etc)
6. What is your current job title?
7. What are your current main responsibilities in the unit? Have these changed since you joined? How?
8. How would you rank your activities in terms of time spent? How would you rank them by order of importance?
9. Could you describe how is your typical day/week?
10. How is your performance evaluated? What are the key performance indicators used?
11. Is your compensation package linked to your and/or the unit's performance?

APPENDIX 6 – INTERVIEW GUIDE – SECOND ROUND OF INTERVIEWS

I) Relationship with corporate parent

1. When you are visiting the company's headquarters in Europe, who do you usually contact?
2. Which media (e.g. E-mail, letters and memos; telephone conversations; videoconference; face-to-face) do you use and with which frequency (e.g. daily, weekly, monthly, rarely, never)?
3. What kind of information you are normally looking for when talking to other units within the firm?
4. Who in your team interacts more frequently with headquarters?
5. Do you and your team have debriefing meetings when one of you comes back from a visit to HQs? Do you keep written records of those meetings?
6. What are the vehicles for down streaming the ideas accessed by the unit? In other words, which media (e.g. E-mail, letters and memos; telephone conversations; videoconference; face-to-face) do you use and with which frequency (e.g. daily, weekly, monthly, rarely, never) to let other units within the organisation know about the opportunities to transfer external technologies you have identified?
7. What exactly does your unit transfer to the rest of the corporation? How is this "transfer" materialised? Could you show me some examples?
8. What is done with the ideas/business plans that are rejected and/or do not receive any reaction from the corporate parent?

II) Relationship with local companies and VC community

1. What are the vehicles for collecting information about local companies?
    a. Do you use databases? Which ones?
    b. How frequently do you participate in conferences both as attendees and panellists?
    c. How frequently do you meet with local companies? (per week or per month)

d. How frequently do you meet with VCs? How do you characterize the unit's relationship with VCs?

2. How does a search start? What typically triggers this search?
3. What are you search criteria, if any, in terms of the types of organisations (e.g. start-ups, mid-size companies, large companies, venture capitalists, universities) where do you search for new technologies? Are these criteria established by your unit or by the parent company?
4. What is the typical profile(s), if any, of the organisations your unit is looking for?
5. What is the typical profile(s), if any, of the organisations that proactively approach your unit?
6. What types of organisations, if any, are less welcoming in talking to a company like yours?
7. Do you use venture capitalists to search for new technologies? How frequently do you meet them? Which types of companies and/or technologies do you access through VCs?
8. How many unsolicited business plans/business proposals do you receive per week/month?
9. How many companies do you physically meet per week/month? With how many companies do you have a phone conversation?
10. How many of those opportunities to transfer an external technology do you flag to other units within your firm? How many of them are acted upon?
11. Are there other issues in your relationship with the sources of external technology that you take into account in your search?
12. Do other units within your firm provide you with leads in relation to specific sources of external technologies that you should look for?
13. What are your search criteria, if any, in terms of the properties of the technologies you look for? Are these criteria established by your unit or by the parent company? How flexible are those criteria?
14. Are the technologies that you search for usually patented?
15. Are there other relevant characteristics of the source of external technology that you consider when you are evaluating an external technology?

16. How do you assess the importance of being located in the [Silicon Valley, Beijing or Tokyo]? What is the impact of geographic closeness in getting access to external technologies?
17. How companies usually react to your approach?
18. Are you able to "see" everything that you need? What is more likely to be invisible to your radar screens?
19. Does the possibility of investing (vis-à-vis just establishing a commercial relationship) enable the unit to see more and better business plans?
20. How is your relationship with the scanning units of other multinational companies?
21. Do you participate in any business association? Why?

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APPENDIX 7 – EXAMPLE OF A TRANSFER-MEMO

Company Name	TechExample
Date Last Seen	06/08/2003
Technological Domain	Commercial & Customer Management; External Interfaces; Service Management;
Product Overview	 Automated Service Agents (ASA) Customer Service Framework (due Q2 2004)
Product Description	TechExample offers a collection of tools for developing conversational (text-based) applications, the servers for deploying them, and a number of pre-built applications for various purposes. In addition to these packaged applications they offer custom applications for a solution tailored to company s specific requirements along with professional services to aid in the development and deployment of interactive agents. An example of an ASA built on Script and run on Script Server is Brasilia Telecom's ASA. (This is actually hosted by TechExample on behalf of Brasilia Telecom but there is also the option for the customer to licence, build and run their own ASAs. The ASA can be intergrated with external data sources via SQL, SOAP, ODBC, etc. To further automate the development and maintenance of the ASAs, they are about to launch (Q2 04) their Customer Service Framework (CSF). This is essentially a content management tool, with the management aimed at 3 levels of adiministration: - Knowledge contributor - customer service rep level provding Q&As to grow the knowledge base (KB) - Knowledge editor - customer service manager level enabling screening and approval of new content prior to adding to KB - Knowledge engineer - softweare engineer level - initial setup of CSF

Relevance to Europ Telco	As services offered by Europ Telco increase in number and complexity, there is a need to provide an improved level of support that encourages take-up and reduces churn, whilst incurring minimal support costs. IVR systems are not popular with customers. Use of ASAs allows a much richer interaction for customer whilst offering the service provider the ability to significantly reduce the calls reached the customer helpd-desk/call centre. ASAs can be used to answer the majority of calls/queries, with only a subset passed through to live customer support individuals. TechExample's ASA solutions can also be used to drive web pages (e.g. providing easier navigation of product portfolio on ET.com). Relevant to Peter King and his team re Global Web Services.
Comments	Tech Example's solution is not based on a natural language processing engine, but on a tunable scripting engine and underlying rule-set and database. Not being grammatically based has advantages in that it can easily cater for other languages, including SMS shorthand The solution is compatible with any text based input (e.g. IM, SMS, e-mail). This could also be combined with a Speech-text engine to allow a voice-driven solution. Although not a technically "pure" solution, the approach could certainly provide Europ Telco with an early solution for automated conversational support (until natural language based approaches mature, become more efficient and extensible (cross-language)
Market	CRM and customer support
Competitors	Hitachi and Nokia, Motorola, Samsung
Customers	ComCast, Reuters
Maturity of company	3rd Round
Date established	05/01/2000
No of employees	24

Financing	$8m raised so far. In the middle of a B Round. Have secured first closing ($3m) of B Round (existing investors. Investors: Angel Partners, Sequoia, Granite
Source of Lead	DataCentre Ventures Conference 2003
Lead Europ Telco Contact	Pierre Daudon
Contact (2)	John Rugby
Contact (3)	Jans Cuypera
URL	http://www.techexample.com
Address	1200 Minuteman Drive, Suite 140, Menlo Park, California
Headquarters / Region	Menlo Park
Other location(s)	Cambridge, UK
Contact name	Jeff Smith
Contact job title	CEO
Contact telephone	650 330 1971
Contact email	jsmith@techexample.com

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APPENDIX 8 – SURVEY INSTRUMENT

TECHNOLOGY SCOUTING RESEARCH

This questionnaire aims at gathering additional information on your introduction of a number of companies to Europ Telco's lines of business. All specific information provided by you will be kept confidential and the results will only be presented in aggregate form.

GUIDELINES ON HOW TO COMPLETE THE QUESTIONNAIRE

SECTION 1
In column 1.2, please indicate the name of the line of business (your internal client) to whom you introduced the company in the column 1.1. In case you have introduced it to more than one line of business, please choose just one and complete all the following questions based on that choice.

SECTION 2
This section aims at understanding the ***level of fit or agreement*** between the business model underlying the external technology of the company in column 1.1 and different dimensions of the business model of Europ Telco's line of business in column 1.2

In questions 2.1 to 2.5, please indicate in a scale 1-5, (where 1=very low; 5=very high) the level of fit/agreement between:

2.1. The external technology **value proposition**—i.e. the value created for users—and the existing value proposition of the line of business;

2.2 The **market segment**—i.e. the users to whom the technology is useful for and for what purpose—targeted by the external technology and the market segment served by the line of business;

2.3 The **value chain structure** required to create and distribute the external technology (and/or the products/services enabled by it) and the current value chain structure of the line of business;

2.4 The **cost structure and profit potential** of producing/using the external technology and the existing cost structure/profit potential of the line of business;

2.5 The **technological standards** of the external technology and the technological standards adopted by the line of business;

SECTION 3
This section aims at understanding your relationship with the line of business in column 1.2:

3.1 Frequency of Interaction
Please indicate how frequently did you and your colleagues in the scouting unit interact with this line of business in column 1.2 on average over the year ***prior*** to the introduction of the company in column 1.1. (1=once a year or less; 2=once every 3-4 months, 3=once every 2nd month, 4=once a month, 5=more than once a month)

3,2 Closeness of relationship
Please indicate how close was the working relationship between your unit and the line of business in column 1.2 ***before*** you introduced the company in column 1.2 to them? (1=Distant, like an arm's length relationship, 3=somewhat close, like solving and discussing issues together, 5=very close, practically like being in the same unit)

SECTION 4
The three questions in this section are regarding an estimate of your efforts 1.in identifying the line of business's roadmaps/requirements/needs/constraints; 2. in searching for external technologies that would meet those requirements and finally3.in downstreaming (i.e. selling internally) the external technologies.

4.1 Please indicate in a scale 1-5 (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time) how much time was spent in the "**internal search**", i.e., identifying the roadmap of the line of business in column 1.2 and in understanding its requirements/needs/constraints?

4.2 Please indicate in a scale 1-5 (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time) how much time was spent in the "**external search**", i.e., searching the external environment looking for the company in column 1.1 that could meet the requirements/needs of the line of business in 1.2?

4.3 Please indicate in a scale 1-5 (1=insignificant amount of time; 3=reasonable amount of time; 5=a lot of time) how much time was spent in the "**internal selling**", i.e., trying to translate the external technology into Europ Telco's language and to"sell" the company in column 1.1 to the line of business in column 1.2?

SECTION 5

This section aims at estimating the potential benefits for Europ Telco due to the internalisation of the external technology developed by the company in column 1.1.

5.1 Please indicate in a scale 1-5 (1=very low; 3=reasonable; 5=very high) the **potential innovation dividends** in terms of cost reductions and/or revenue generation due to the internalisation by Europ Telco of the external technology developed by the company in column 1.1.

Once completed, please return this questionnaire to Felipe Monteiro at London Business School, email fmonteiro@london.edu, ph. + 44 (0) 20 7000 8761, fax + 44 (0) 20 7000 7001

SECTION 1		SECTION 2					SECTION 3		SECTION 4			SECTION 5
External Source	Internal customer	Degree of Fit					Your Relationship with the Line of Business		Your Search and Transfer Efforts			Potential Benefits
	1.2 Which Line of Business did you introduce this company to?	2.1 Value proposition	2.2 Market segment	2.3 Value chain structure	2.4 Cost structure/ profit potential	2.5 Techno-logical standards	3.1 Frequency of interaction	3.2 Closeness of relationship	4.1 Internal search effort	4.2 External search effort	4.3 Internal Selling effort	5.1 Potential innovation dividends
ABCD		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
XXXX		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
XYXT		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ALAD		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
XKXKX		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
DLDLDLD		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
NDMDLD		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
XLXLXL		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
XDLDLD		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
PQPQPQ		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
WOWOW		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
ZVZVZV		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
EIEIEIi		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
FJFJFJ		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
DKDKDKD		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
RORORO		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
WCWCWC		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

APPENDIX 9 – ROBUSTNESS CHECK - MODELS WITH ALTERNATIVE OPERATIONALISATIONS OF KNOWLEDGE RELATEDNESS

	Model 3	Model 4
Knowledge Dissonance	-0.54***	-0.68***
	(0.13)	(0.17)
Market Proveness	0.27*	0.537**
	(0.13)	-0.19
Dissonance X Proveness	0.09*	0.11*
	(0.04)	(0.05)
External Search	0.05	0.32
	(0.24)	(0.28)
Matching	1.08*	1.30*
	(0.42)	(0.66)
Internal Search	0.63*	1.33***
	(0.26)	(0.38)
Internal Selling	0.36†	0.56*
	(0.18)	(0.25)
Tie strenght	-0.19	-0.19
	(0.13)	(0.16)
Geographic distance (ln)	-0.05	-0.09
	(0.07)	(0.08)
Innovation dividends	-0.03	0.13
	(0.23)	(0.24)
Source age (years)	0.04	0.09
	(0.11)	(0.12)
Source size (ln)	0.14	0.11
	(0.14)	(0.15)
Motivation Source	0.25	0.65
	(0.52)	(0.66)
Knowledge relatedness (industry alternative)	-0.56	
	(0.54)	
Knowledge relatedness (patent based)		0.08
		(0.07)
_cons	2.50	3.13
	(1.30)	(1.73)
N	109	88
Wald Chi2	53.88***	46.50***
Log likelihood	-33.79	-23.38
McFadden's pseudo R2	0.55	0.61

† p < 0.10, * p < 0.05; **p < 0.01, ***p<0.001. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

Figure 0-1: Robustness Check - Interaction Effect in Model 3

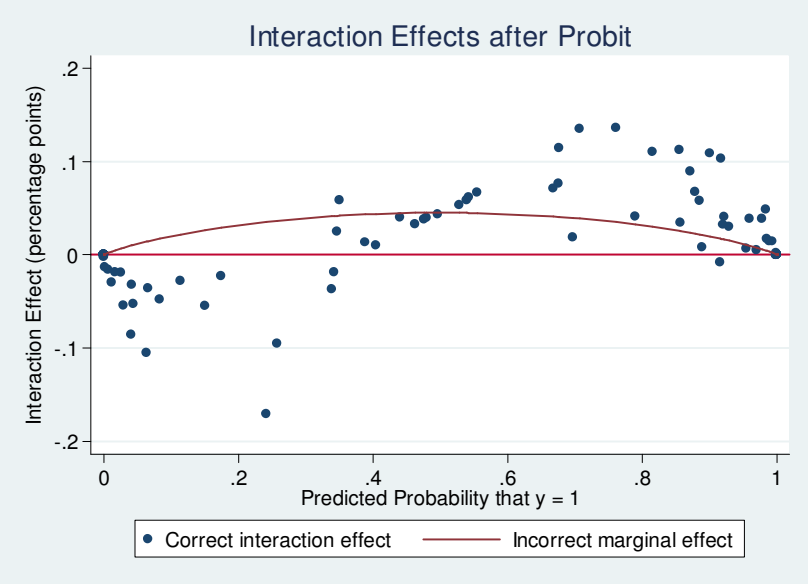


Figure 0-2: Robustness Check - Interaction Effect in Model 4

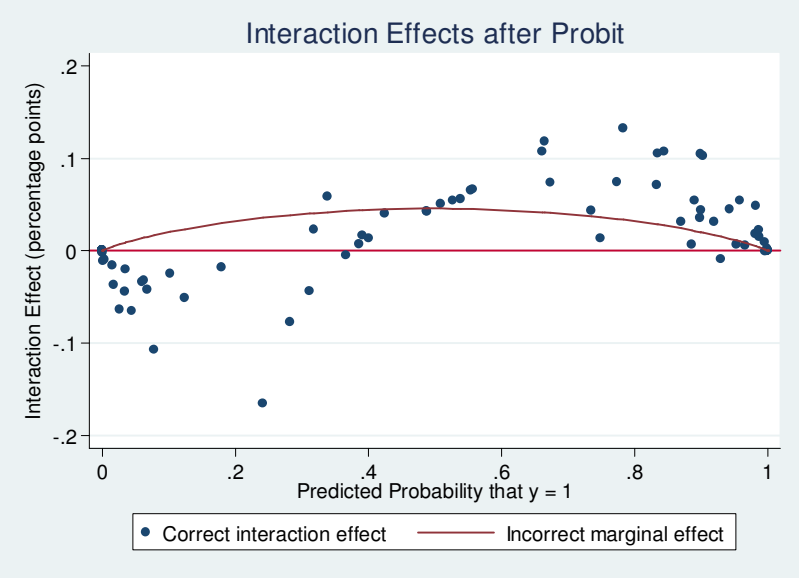


Figure 0-3: Robustness Check - Z-Statistics of Interaction Effects Model 3

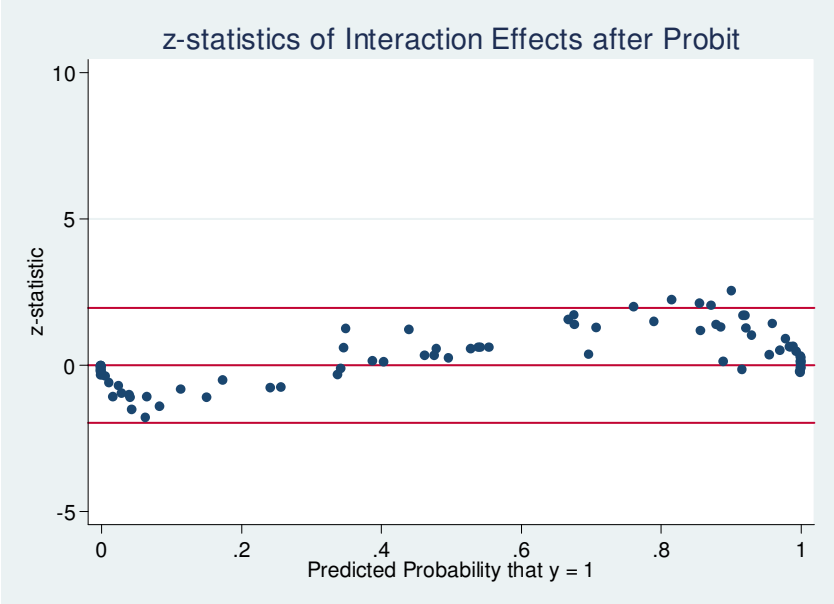
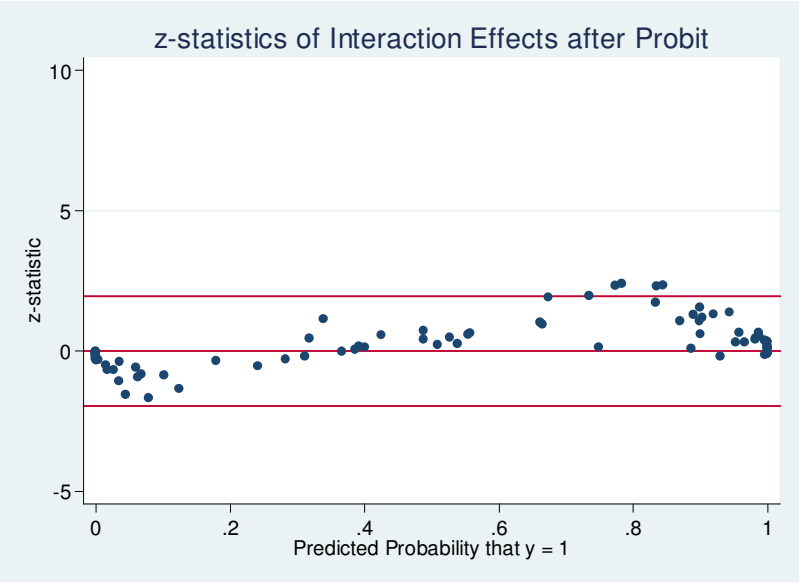


Figure 0-4: Robustness Check - Z-Statistics of Interaction Effects Model 4



APPENDIX 10 – Robustness Check - Alternative Measures of Patent-Based Knowledge Relatedness

		Obs	Mean	Std.	Min	Max
Relatedness 1	Dummy variable =1, if Europ Telco and external source have any patenting in the same technology class, zero otherwise	101	0.98	0.14	0	1
Relatedness 2	Number of external source patents with same classes as Europ Telco's	101	7.67	15.50	0	141
Relatedness 3	Number of technology classes in common between Europ Telco and external source/Total number of classes the external source has patenting activity	101	0.95	0.17	0	1
Relatedness 4	Dummy variable =1, if Europ Telco and external source have any patenting in the same technology sub-class, zero otherwise	101	0.77	0.42	0	1
Relatedness 5	Number of external source patents with the same sub-classes as Europ Telco's	101	3.67	12.13	0	118
Relatedness 6	Number of technology sub-classes in common between Europ Telco and external source/Total number of sub-classes the external source has patenting activity	101	0.40	0.36	0	1
Relatedness 7	Number of Europ Telco's patents in the same classes as the external source	101	110.10	97.69	0	471
Relatedness 8	Number of Europ Telco's patents in the same sub-classes as the external source	101	6.04	21.10	0	209

APPENDIX 11 – ROBUSTNESS CHECK ALTERNATIVE OPERATIONALIZATION OF MARKET PROVENNESS

	Model 5
Knowledge Dissonance	-0.52***
	(0.14)
Market Proveness II	0.26†
	(0.15)
Dissonance X Proveness II	0.07†
	(0.04)
Other Telco Buying (dummy)	0.80†
	(0.44)
External Search	0.059
	(0.24)
Matching	1.19**
	(0.43)
Internal Search	0.65*
	(0.26)
Internal Selling	0.34†
	(0.17)
Tie strenght	-0.18
	(0.13)
Geographic distance (ln)	-0.09
	(0.07)
Innovation dividends	0.00
	(0.23)
Source age (years)	0.03
	(0.10)
Source size (ln)	0.09
	(0.14)
Knowledge Relatedness	-0.20
	(0.38)
Motivation Source	0.40
	(0.50)
_cons	2.61*
	(1.32)
----------	----------
N	109
Wald Chi2	42.70***
Log likelihood	-32.37
McFadden's pseudo R2	0.57

† p < 0.10, * p < 0.05; **p < 0.01, ***p<0.001. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

APPENDIX 12 – Robustness Check—Alternative Measure of Knowledge Dissonance

	Model 6
Knowledge Dissonance II	-0.44**
	(0.13)
Market Proveness	0.30*
	(0.13)
Dissonance II X Proveness	0.09*
	(0.04)
Misfit technological standards	-0.82***
	(0.20)
External Search	0.00
	(0.24)
Matching	1.02**
	(0.44)
Internal Search	0.64*
	(0.30)
Internal Selling	0.35*
	(0.17)
Tie strenght	-0.10
	(0.14)
Geographic distance (ln)	-0.05
	(0.06)
Innovation dividends	-0.01
	(0.22)
Source age (years)	0.00
	(0.10)
Source size (ln)	0.13
	(0.14)
Knowledge Relatedness	-0.20
	(0.39)
Motivation Source	0.23
	(0.56)
_cons	4.13*
	(1.50)
N	109
Wald Chi2	48.98***
Log likelihood	-31.70
McFadden's pseudo R2	0.58

† p < 0.10, * p < 0.05; **p < 0.01, ***p<0.001. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

APPENDIX 13 – ROBUSTNESS CHECK - MODEL WITHOUT THE INTERACTION TERM

	Model 7
Knowledge Dissonance	-0.43***
	(0.11)
Market Proveness	0.23*
	(0.12)
External Search	0.011
	(0.22)
Matching	1.16**
	(0.43)
Internal Search	0.64**
	(0.24)
Internal Selling	0.37*
	(0.17)
Tie strenght	-0.17
	(0.12)
Geographic distance (ln)	-0.08
	(0.06)
Innovation Dividends	-0.10
	(0.23)
Source age (years)	0.05
	(0.09)
Source size (ln)	0.09
	(0.14)
Knowledge Relatedness	-0.04
	(0.37)
Motivation Source	0.52
	(0.50)
_cons	7.53**
	(2.45)
N	109
Wald Chi2	41.87**
Log likelihood	-35.51
McFadden's pseudo R2	0.53

† p < 0.10, * p < 0.05; **p < 0.01, ***p<0.001. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

APPENDIX 14 – ROBUSTNESS CHECK - MODEL WITH A CONTROL VARIABLE FOR LAPSED TIME

	Model 8
Knowledge Dissonance	-0.50***
	(0.13)
Market Proveness	0.29*
	(0.12)
Dissonance X Proveness	0.07†
	(0.04)
External Search	0.07
	(0.24)
Matching	1.17**
	(0.40)
Internal Search	0.63*
	(0.26)
Internal Selling	0.34†
	(0.18)
Knowledge Relatedness	-0.15
	(0.12)
Tie strenght	-0.06
	(0.07)
Geographic distance (ln)	-0.03
	(0.23)
Innovation dividends	0.06
	(0.10)
Source age (years)	0.12
	(0.14)
Source size (ln)	-0.26
	(0.35)
Motivation Source	0.40
	(0.54)
Time lapsed	0.20
	(0.21)
_cons	1.54
	(1.44)
N	109
Wald Chi2	54.15***
Log likelihood	-33.82
McFadden's pseudo R2	0.55

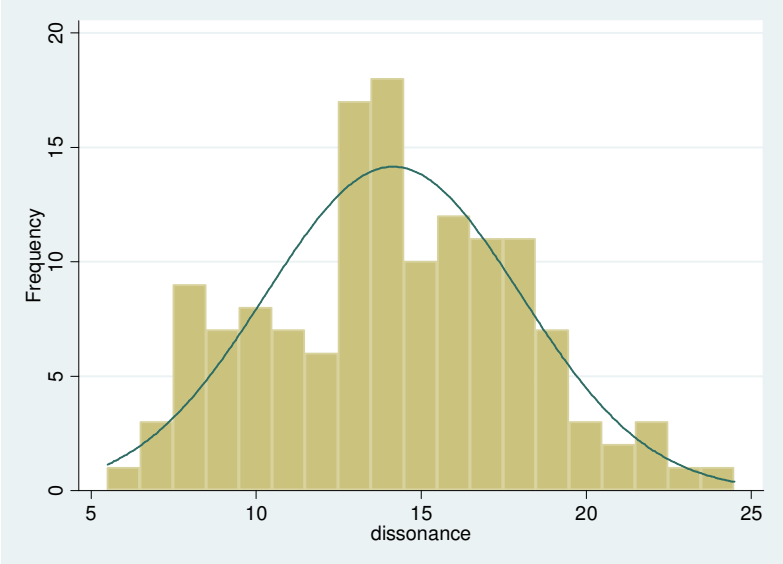
† $p < 0.10$, * $p < 0.05$; ** $p < 0.01$, *** $p<0.001$. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

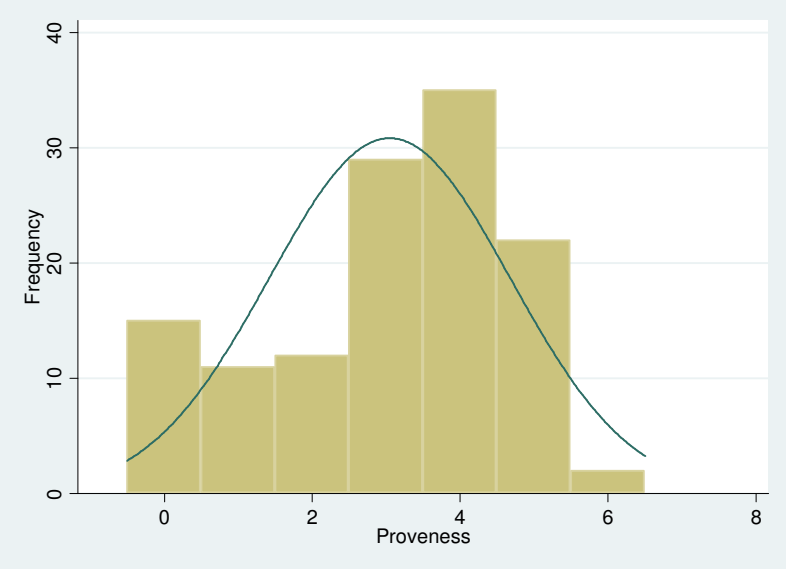
APPENDIX 15 – Robustness Check—Model controlling for Patent

	Model 9
Knowledge Dissonance	-0.50***
	(0.13)
Market Proveness	0.30*
	(0.13)
Dissonance X Proveness	0.07†
	(0.04)
External Search	0.06
	(0.24)
Matching	1.25**
	(0.47)
Internal Search	0.60*
	(0.25)
Internal Selling	0.33†
	(0.18)
Knowledge Relatedness	-0.05
	(0.35)
Tie strenght	-0.14
	(0.13)
Geographic distance (ln)	-0.07
	(0.07)
Innovation dividends	-0.01
	(0.24)
Source age (years)	0.07
	(0.11)
Source size (ln)	0.12
	(0.13)
Motivation Source	0.25
	(0.55)
Patent dummy	-0.46
	(0.41)
_cons	2.45
	(1.25)
N	108
Wald Chi2	54.86***
Log likelihood	-33.55
McFadden's pseudo R2	0.55

† p < 0.10, * p < 0.05; **p < 0.01, ***p<0.001. Two-tailed tests. Robust standard errors between parentheses. Scouters and recipient unit dummies included in all models but not shown

APPENDIX 16 – Robustness Check—Histograms of Knowledge Dissonance and Market Provenness





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