Factors that have an impact on the exploitation of external knowledge in continuous product innovation processes

Gunnar Óskarsson

External knowledge

External sources of knowledge are critical to the innovation processes of firms, and the ability to exploit external knowledge is critical to the firms’ innovation performance. Researchers have recognized that small firms or new ventures are increasingly engaging in R&D co-operative engagements for a variety of reasons, such as to complement their internal resources, to quickly gain technical capabilities, and for their desire to minimize fixed costs associated with acquiring capital assets. It is further acknowledged that knowledge is one of the most valuable resources for innovation. Due to scarce resources, increased speed of development and increased need for specialization, firms need to complement their resources, especially knowledge, from external sources. One of the key elements for sustainable competitive advantage is therefore the firms capability to interact with external sources to access, acquire and develop new knowledge that they can exploit in their innovation processes (Caloghirou, Kastelli et al., 2004).

Firms can interact in various ways to access knowledge outside their boundaries and there are many mechanisms that can facilitate interaction which enables dissemination and production of new knowledge. Successful interaction for innovative processes requires new managerial skills and culture (Dodgson, 1993; Tidd and Trehella, 1997), and there is an increased need for firms to eliminate barriers that might limit effective exploitation of external knowledge. The aim of this paper is to identify factors that have an impact on successful exploitation of external sources of knowledge in innovation processes.
Continuous product innovation processes

Traditionally, new product development projects have been seen as isolated efforts focused on radical innovations, and are managed and controlled accordingly. There is strong evidence that this approach may not be most appropriate for many organizations in today’s turbulent and demanding environment, when customers are continuously offered new features and variations in their products. Firms have therefore gradually, come to discover that radical innovation is not the only approach to improve their competitiveness and that incremental innovation and continuous access to new knowledge based on high levels of participation, represents a potential competitive advantage (Bessant and Caffyn, 1997). To complement their resources and capabilities, and to meet the demand for faster speed to market of new products, firms do increasingly co-operate and involve customers and partners outside the organisational boundaries. Following these changes firms need to emphasize managerial skills that stimulate the utilization of external knowledge and co-operation in innovation processes. The future organization, will be an open and networked organization that focuses on continuous innovation (CI) and learning, in which suppliers, customers and even competitors will become part of (Boer and Bessant, 2003). Successful continuous innovation is beneficial to a wide variety of stakeholders, including customers, employees and owners/shareholders of companies. The achievement of such benefits requires company-wide involvement and commitment, cross-departmental and inter-organisational collaboration, continual learning (and unlearning), and deep insight into the innovation process.

Exploitation of external knowledge

A deeper understanding on how firms are organised to exploit external knowledge in continuous innovation and their knowledge processes might provide an important contribution to the theory of continuous innovation. Of particular interest is to identify factors that firms employ to mobilise employees to effectively explore and exploit knowledge in their environment, such as from their suppliers, technological alliances and subsidiaries in foreign markets.
Networking

Networking is an increasingly important source in firm’s innovation processes particularly when firms need to access multiple technologies in their products (Hagedoorn and Schakenraad, 1994; Granstrand, Patel et al., 1997; Narula, 2004). Networks can provide a bridge between disciplines in an age of fragmentation of knowledge about technology or the application of technology (DeBresson and Amesse, 1991). As noted by Hagedoorn and Schakenraad (1994), this increase can be attributed to “the rapid changes in technological development, the necessity of quick pre-emption strategies, complexities and surrounding technological developments, and the necessity for large firms to monitor a wide spectrum of technologies” (p. 291). Networking appears to be beneficial for both large and small firms. Several scholars have proposed that networking is primarily beneficial for small companies involved in related lines of business. One of the major advantages for small firms is to complement their constrained resources and to gain access to scientific knowledge and capital intensive R&D activities. The major advantage for large firms is to increase their flexibility by partnering with smaller firms, which are more flexible and furthermore, tend to be more innovative.

Several factors that have an impact on the effectiveness of network relationships were identified in the literature. An empirical research on small UK electronics and software firms (Romijn and Albaladejo, 2002), revealed that it was not the intensity of networking, but the frequency of interaction with the science base that contributed most to innovation capability. Proximity with networking partners builds up personal relations and trust and increases the effectiveness of learning by close interaction and provide firms with access to knowledge and R&D that they could otherwise not access or afford to create (Baptista and Swann, 1998).

Network governance, including the structure and management of networks, can have important implications for the outcome or effectiveness of networks. Network governance is a distinct form of coordinating economic activity, which involves a select, persistent, and structured set of firms (as well as not for profit agencies) engaged in creating products or services based on implicit and open-ended contracts which are socially, but not legally binding. Network governance facilitates integrating multiple autonomous, diversely skilled parties under intense time pressures to create complex products or services.
The choice of governance structure can have important implications for the success of the network, including coordination costs, flow of information, and incentives for participation. Too much or rigid structure increases cost and reduces motivation, whereas too loose structure can lead to complete chaos and lack of integration. The key challenge for innovation networks and the transfer of knowledge is to set up a network structure that creates “incentives for participation and co-operation that recognizes the contribution of any actor who shares his knowledge assets” (Sawhney and Prandelli, 2000, p. 31).

Internationalization

Two dimensions of internationalization contribute to knowledge transfer from external sources for innovation processes, the utilisation of technical knowledge from cross-boarder alliances and subsidiaries, and transfer of market information from sales and services in foreign subsidiaries (Bartezzaghi, Corso et al., 1998). International diversification provides the firm with the opportunity to exploit the benefits of internalization, which refers to bringing new foreign operations within the boundaries of the firm and to perform many activities internally (Hitt, Hoskisson et al., 1997). Internationally diverse firms are exposed to new and diverse ideas from multiple market and cultural perspectives and provide the firm an incentive to innovate, which is particularly important in markets where product life cycles are becoming shorter, and they achieve higher returns from their investments in producing the innovation.

In their study on the effect of international expansion on new venture firms performance, Zahra, Ireland et al. (2000) found a strong relationship between international diversity (number of countries, technological diversity, cultural diversity, geographic diversity and foreign market segments) and mode of market entry on the breadth and depth and speed of technological learning, especially when the firm undertakes formal knowledge integration. Knowledge integration is an integral component of routines to capture information and skills gained from international expansion activities that guide the firm’s future actions (Teece, Pisano et al., 1997). Abrahamson and Fombrun (1994) revealed a similar relationship and argue that organizations that operate in diverse national and/or product markets have access to information’s on new ideas and practices that sparks innovations and boosts technological capabilities.
Frost (2001) argues that an important aspect of the competitive advantage of multinational firms is the capacity of their foreign subsidiaries to generate innovations based on stimuli and resources resident in the heterogeneous environments in their host country subsidiaries. Bartlett and Ghoshal (1988) argue that management processes and structure, particularly the structure of relationships with their foreign subsidiaries, can impede the firm’s ability to capitalize on its technological assets and its worldwide market position.

Gupta and Govindarajan (2000) advanced the theoretical framework pertaining to intra-corporate knowledge transfer within multinational corporations (MNCs). They found a strong support for knowledge flows from the parent company to subsidiaries, but not for knowledge flows from subsidiaries to the parent company. They argue that the reason might be that the parent company has the longest experience in undertaking knowledge outflows from the center to the units, there might be a lack of motivation for the subsidiary to share knowledge, and the knowledge transfer process might not sufficiently facilitate knowledge flows. Furthermore, they argue that stronger motivation from the parent company to acquire knowledge from subsidiaries as well as effective transmission channels might have a positive impact on knowledge flows from subsidiaries.

Framework for the research

As a result of a research initiative conducted by CINet (Continuous Innovation Network), a number of tools for researchers have been developed for research in continuous innovation, including the CIMA model. The CIMA model has its roots in theory on learning and innovation, and twelve in-depth case studies carried out by members of CINet. The model depicted in figure 1 explains the operation of continuous learning within product innovation processes and the relationship between variables that have an impact on performances in continuous innovation processes.
Performances, which relate to an improvement in capabilities within the firm, are the result of improvement activities carried out in the product innovation process. It can be 'measured' by, for instance, looking at the generation of improvements and the diffusion of improvements and learning experiences within and between product innovation projects.

Improvements in performances are achieved by a set of behaviours enacted by individuals, such as creating, using and transferring knowledge; aligning improvement activities with strategic goals and objectives; and experimenting with new solutions.

These behaviours can be influenced by the implementation and application of levers. Levers or enablers are mechanisms that managers use when managing learning in product innovation process, even though they may not be consciously trying to stimulate learning. If adequately oriented, however, these mechanisms can have a substantial influence on a firm’s attitudes and practices in creating, storing and transferring knowledge. Examples of categories of levers include strategic planning and policy deployment, organisational integration mechanisms, project planning and control, performance measurement, design techniques and methods, computer-based technologies, and human resource management activities.

Contingencies are factors that influence the choice of levers to foster behaviours (for instance the size of the company, the market situation, and product and process complexity). Some of the contingencies are external to the firm, in which the firm has no impact on, but other contingencies can be influenced by the firm, such as by strategy and management actions.

Capabilities can be described as integrated stocks of resources that are accumulated over time through learning, or established through deliberate decisions. These stocks of resources include internalised behaviours, technical skills, organisational routines, and corporate assets (i.e. Information Systems, databases, libraries, tools, and handbooks). The level of a
company's CI (continuous innovation) capabilities determines the efforts that are needed to stimulate the corresponding behaviours.

The variables in the model have been tested on data from the complete CINet database, which included data on over 1,000 production units in various countries in Europe when the project was conducted. A questionnaire and a workbook has been designed to assist researchers in applying the model.
The variables that were measured in the CIMA model are summarised in figure 2. Many of the variables in the model were supported in this research which is focused on the identification of factors that have an impact on the
exploitation of knowledge from inter-firm relationships and performance in continuous innovation.

Table 1 summarises additional factors that were identified in this research and which have an impact on the utilisation of external knowledge in innovation processes.
Table 1. Factors that have an impact on the exploitation of external sources of knowledge in innovation processes

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<th>Levers</th>
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<td>Slack (L11)</td>
<td>Has an impact on the time that employees spend on exploration of new knowledge vs. exploitation of existing knowledge.</td>
<td>(March, 1991; Gieskes, Hyland and Magnusson, 2002)</td>
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<td>Search rules and practices (L7)</td>
<td>Facilitate search by establishing channels of communication. Communication channels, including ICT and portals facilitate search and exchange of ideas.</td>
<td>(March, 1991; Pavesi, 2003)</td>
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<td>Incentives (L4)</td>
<td>Incentive system designed to stimulate interaction with the science base. Frequency of interaction with the science base increases innovation capability.</td>
<td>(Kerssens-van Drongelen and Cooke, 1997; Romijn and Albaladejo, 2002)</td>
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<td>Routines (L3)</td>
<td>Establish routines that facilitate knowledge integration. Increases the firms’ capability to capture information and skills gained from international activities.</td>
<td>(Abrahamson and Fombrun, 1994; Teece, Pisani et al., 1997)</td>
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<td>Motivation (L6)</td>
<td>Performance measurement and transmission channels designed to increase transfer of knowledge from subsidiaries. Stronger motivation of subsidiaries and good transmission channels will facilitate knowledge flows and increase innovation capability.</td>
<td>(Gupta and Govindarajan, 2000)</td>
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<td>Structure of relationships in foreign markets (L10)</td>
<td>Structure of subsidiaries relationships with suppliers and customers in foreign markets has an impact on the assimilation of new knowledge from outside.</td>
<td>(Andersson, Forsgren et al., 2001)</td>
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<td>Network structure (L9)</td>
<td>An appropriate network structure creates incentives for participation and co-operation. Participation in networks increases knowledge flows and increases innovation capability.</td>
<td>(Gulati and Singh, 1998)</td>
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interaction and access to know knowledge.

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<th>Contingencies</th>
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<td>Proximity (E10)</td>
<td>Proximity with networking partners builds up personal relations and trust and increases the effectiveness of learning by close interaction. Provides firms with access to knowledge and R&amp;D that they could not otherwise not access or afford to create.</td>
<td>(Baptista and Swann, 1998; Audretsch, 2000; Baptista, 2001; Dahl and Pedersen, 2003)</td>
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<tr>
<td>Diversity (E1)</td>
<td>Organisations that operate in internationally diverse markets have access to information and new ideas and practices that sparks innovation.</td>
<td>(Zahra, Ireland et al., 2000)</td>
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A proposed research model based on factors from the CIMA model and the additional factors identified in this research are summarised is explained in figure 3. The model demonstrates relationship between factors that have an impact on the utilisation of external sources of knowledge in innovation processes. The factors that were identified in this research are highlighted and new factors are specified. The framework in the model will be followed in this research to investigate the relationships between factors depicted in the model on data from Icelandic firms that operate in domestic and foreign markets. The main focus will be on the factors which are highlighted in figure 3. In order to compare the results with firms from other countries in the CINet database, the focus will be on production firms that operate in foreign markets. Iceland is an interesting market for the study since the total population of firms in Iceland that fit our criteria is reasonably small and can all be included in the research. This will open possibilities for a combination of quantitative and qualitative research on the total population in one economy and from one culture, which might provide interesting results.
Figure 3. A Proposed research model
References


