Challenges in Commercialisation Processes of Product Innovation among SMEs

Miika Kajanustain, Mikko Heinonen², Tuomo Eskelinen³ and Jarkko Pellikka¹

¹Project manager, Savonia University of Applied Sciences, Miika.Kajanus@Savonia.fi
²RDI Adviser, Savonia University of Applied Sciences, Mikko.Heinonen@Savonia.fi
³RDI Adviser, Savonia University of Applied Sciences, Tuomo.Eskelinen@Savonia.fi

Abstract

Commercialisation presents complex challenges for both large and small and medium-sized firms, particularly those operating in high technology fields. Many activities, resources and external organisations are often needed in order to bring a new product to market in increasingly competitive, dynamic modern business environments, in which the ability to rapidly create and commercialise new products is an important factor that provides several business benefits. It is therefore important to examine the problems that affect the commercialisation process, which was the main objective of this study. The study was conducted following the strategy of case study methodology (cross-cases), where the main purpose was to search for similarities and differences among three case firms in order to acquire a more sophisticated understanding of the challenges affecting commercialization process of product innovation. The results show that the main challenges confronted during the commercialisation process of product innovation can be divided into four main categories: 1) marketing, 2) financing, 3) networking, and 4) business environment. In addition, one of the main contributions of the paper is that it identifies internationalisation as one of the main challenge, which is related to all of the identified challenge categories.

Keywords: Challenges; commercialization process; product innovation; small and medium-sized firms; internationalization

Acknowledgements

The authors are grateful to the Foundation for Economic Education, the Foundation of Small Business Center and the Finnish Foundation for Economic and Technology Sciences (KAUTE). In addition, we are grateful to the participants at the EBRF 2011 Conference, December 14-15, 2011 Aalto University, Espoo, Finland at where an earlier draft of this paper was presented.
Introduction

Globalisation, technological developments and rapidly changing customer requirements have increased the significance of small and medium-sized firms (SMEs) due to their ability to create and exploit innovation (Allocca & Kessler 2006). According to Schumpeter’s (1934) milestone study, entrepreneurs play a crucial role in the creation and exploitation of innovations, and technological innovation in particular is recognised as a prime requirement for stimulating productive capacity and ensuring global business success (Kozmetzky et al. 2004). Consequently, both researchers and policy-makers have made increasing efforts to identify ways to foster and support entrepreneurship and small technology businesses in modern, dynamic business environments in order to promote economic growth (Audretsch 2004). A process that is recognized as playing a key in this context, particularly in rapidly moving, is commercialization (Jolly 1997; Andrew & Sirkin 2003; Fetterhoff & Voelkel 2006).

Previous studies have shown that realising the potential benefits of innovation requires an effective commercialisation process (Ford & Saren 2001; Andrew & Sirkin 2003), whereby potential products are generated from ideas and transformed into market-competent products. Further, developing effective commercialisation processes is a complex, challenging task for small technology firms in the modern business environment, in which customer requirements are rapidly changing and the life-cycles of new products are shortening. This is especially significant in high technology branches since technologies are changing so rapidly that small technology firms specialising in the production of high-technology products must match or exceed the pace of change in order to maintain competitiveness (Kozmetzky et al. 2004). Partly for these reasons, small technology firms are increasingly using external competencies and knowledge, accessed via innovation-related networking, in order to accelerate commercialisation, and to reduce associated risks and costs (Chesbrough 2003; Slowinski et al. 2009). Further, as shown by empirical data presented by Feldman (1994), regional contributions to product innovation are related to the underlying inter-organisational relationships, technological infrastructure and availability of relevant knowledge inputs, all of which are mutually reinforcing determinants of a region’s competitive advantage. These factors are especially important for small and medium-sized firms, which may be more deeply embedded in regional innovation systems than large corporations, and thus more dependent on the regional innovation infrastructure and social networks (Galbraith et al. 2008).
Commercialisation presents complex challenges for SMEs, particularly those operating with the product innovations in a dynamic business environment. Many activities, resources and external organisations are often needed in order to bring a new product to market in increasingly competitive, dynamic modern business environments, in which the ability to rapidly create and commercialise new products is an important factor that provides several business benefits. It is therefore important to examine the problems that affect the commercialization process, which was the main objective of this study. According to the previous studies, four main categories of problems have been identified to affect the commercialisation process the categorisation also reflects the complex, multidimensional nature of the commercialisation process. Further, the problems are related to both internal and external factors of the small technology firms, which makes it even more challenging to manage and control the process, and there is a need for more specific, concrete identification of the problems the small and medium-sized firms may face.

In this study, small and medium-sized firm technology firm is defined as an enterprise that employs less than 250 persons, has an annual turnover EUR 50 million (or less) and/or total annual balance sheet of EUR 43 million or less (OECD 2005), exploits technological knowledge and competes by developing and selling products and/or services based on technological innovations (Yli-Renko & Janakiraman 2008).

OBJECTIVES OF THE STUDY

Small and medium-sized firms are currently facing increased competition characterized by product and market uncertainties, the internationalisation of markets, transfer of technologies and large amount of knowledge and information. In this environment, the ability of firms to rapidly create and commercialise new products has posed considerable challenges particularly for the small businesses (Pellikka & Lauronen 2007; Oakey 2007). In a dynamic business environment an effective commercialization process of innovation may secure the survival of a venture and may also provide benefits such as growth of turnover, higher profits and higher market share (Nevens et al. 1990). However, an empirical analysis of the concrete problems of commercialisation of small and medium-sized firms is still partly missing (see e.g. Pellikka & Virtanen 2009). Therefore, our purpose is to empirically identify the challenges that small and medium-sized firms have confronted during the commercialization process of the product innovation from the perspective of small and medium-sized firms by addressing the following research questions:

• How have the problems of the commercialization process of small and medium-sized firms been dealt with in former studies?

• What problem areas and concrete problems do small and medium-sized firms confront during the commercialization process of the product innovation?
This paper provides a framework of the problems of commercialization based on the review of literature from entrepreneurship, innovation management, new product development and marketing. We will begin by briefly discussing the concept of the ‘commercialization process’ and focus on the conceptual framework of the problem areas. The methodology and empirical case data obtained from four small and medium-sized firms will then be presented; the empirical results of the study will then be given and the paper will end with a discussion of the results, followed by conclusions, implications and our recommendations for managers and policy-makers.

Challenges of the commercialization process of product innovation

Commercialisation is important for survival in competitive markets and has also been recognised as a key aspect of national and regional innovation policies (Clarysse et al. 2005) and the management of technological innovations (Dodgson 2000). Interest in the commercialisation process has been prompted by acknowledgement that technological improvements do not contribute to growth unless they are somehow commercialised, either in the form of new products and services, or integrated into production or service delivery processes (Andrew & Sirkin 2003). In this paper, the term ‘commercialization process’ refers to an essential element of the management of technological innovation (Dodgson 2000); the process whereby investments in technological innovation are effectively commercialized, from the generation of ideas through to activities sustaining the commercialized product. A comprehensive analysis of the term has been previously presented elsewhere (see in detail Pellikka 2009).

Due to characteristics such as their general lack of resources for R&D and marketing, small technology firms differ from larger firms in ways that have particular significance for innovation in high technology fields (e.g. Siu & Bao 2008). A major difference in terms of resources is that (inevitably) small technology firms have comparatively limited resources for marketing and financial activities that may limit the scope and timeframe for commercialisation (e.g. Heydebreck et al. 2000). Furthermore, limited human resources may influence a firm’s propensity and ability to be aware of, and respond to, opportunities and threats presented by the external business environment compared with larger firms (North et al. 2001). In addition, they face challenges related to their limited business know-how with regard to aspects such as marketing and management, which potentially makes them more dependent on external resources and networking (Teece 2007). However, since the structure and processes in small and medium-sized firms are often more informal (and their managerial experience and expertise may be limited) their business objectives and strategies may be unclear, particularly during the start-up phase of a firm (e.g. Page West III and Noel 2009). In addition, there is a need to understand the impact of the individual traits of the entrepreneur on ways in which the business is managed and developed that affect aspects such as growth orientation, innovation activities and interest in using external support services (North et al. 2001).
RESEARCH DATA

The focus of this study is on commercialisation processes of product innovation in small and medium-sized firms. The empirical material used in the study consisted of two types of data: 1) responses to questions asked in in-depth interviews (3 cases) and 2) documented data such as annual reports and financial statements. The interviewees were mostly the CEOs of their respective firms. Most of the data acquired were qualitative, which can be highly useful for obtaining a holistic overview of the context of investigated phenomena (Miles and Huberman 1994). Qualitative analysis therefore seemed to be an appropriate way to address the main objectives, which included exploring the ways that entrepreneurs in a particular setting come to understand, plan and manage the activities involved in the commercialization process. The decision to use a qualitative approach was also based on the fact that little is known about the phenomena under investigation, particularly in a small and medium-sized firm context, indicating that qualitative case studies would be an appropriate choice of methodology (e.g. Eisenhardt and Graebner 2007). However, although a qualitative approach was generally adopted, the option of using quantitative data to supplement the examination of the commercialization process was kept in mind, following the logic of versatile research design and enabling triangulation where possible e.g. Yin 1989). The description of the case firms have presented in Table (1).

<table>
<thead>
<tr>
<th>Case firms</th>
<th>Year of establishment</th>
<th>Turnover (2010)</th>
<th>Number of employees</th>
<th>Type of Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case A</td>
<td>2001</td>
<td>6,7 M€</td>
<td>25-35</td>
<td>Wood component manufacturer</td>
</tr>
<tr>
<td>Case B</td>
<td>1985</td>
<td>17 M€</td>
<td>60-75</td>
<td>High-tech wood product manufacturer</td>
</tr>
<tr>
<td>Case C</td>
<td>2011</td>
<td>&lt;1M€</td>
<td>1-5</td>
<td>New technology products for transportation business</td>
</tr>
</tbody>
</table>

Table 1. Description of the case firms

In order to identify similarities and differences among the case firms, an explanation-building procedure was applied in cross-site (case) analysis in an attempt to acquire further insight into issues concerning the challenges identified during the commercialisation process in these firms. Initial contacts with the case firms were made by the telephone. Each interview was conducted during November and December 2011 by using a personally administered semi-structured theme interview.
The checklist of the interview consisted of three main groups of questions:

- Background data and the history of the firm
- The description of the process of commercialisation
- The concrete problems identified during the process.

The average interview lasted from 1 to 2 hours. At the very beginning of each interview, respondents were asked to base their answers on the technology-based product that they had recently commercialised. After that, the respondents were asked to share a detailed description of the concrete problems that they have confronted during the commercialisation process. The data analysis was executed via three-pronged analysis (see Miles and Huberman, 1994). Thus, the analysis included three main phases:

- Reducing of data
- Clustering of data
- Abstracting of data.

First, the irrelevant empirical data was discarded, following which the data was clustered to constitute the main problem groups of commercialisation. During the systematic data clustering process, the main problem groups of commercialisation were formed. During the third stage, the data was abstracted and quantified to systematically exploit the empirical data.

**RESULTS OF THE STUDY**

The results show that the main challenges confronted during the commercialisation process of product innovation can be divided into four main categories: 1) marketing, 2) financing, 3) networking, and 4) business environment. In addition, the general lack of knowledge-based resources to support various business functions (e.g. internationalisation, marketing and financing) was found to be a major problem among the case firms. Thus it is important for firms’ internal activities of the firm and external support services to be targeted to complement their particular limitations of knowledge-based resources. Furthermore, the results indicate that innovation support services should be more flexible and less bureaucratic corroborating previous studies (see Heydebreck et al. 2000; Kaufmann & Tödtling 2002). The entrepreneurs are normally not very well aware of the official procedures required for accessing resources such as public finance. Further, these procedures normally take more time than estimated, and there may be no need for funding that could be acquired by the time the final decision is made, particularly in dynamic business environment and industries.
In addition, the purpose of the funding may change, and hence the process may need to be started again from the beginning. The following table (Table 1) provides a detailed description of the identified challenges in the case firms. In addition, it describes what has been the impact of the faced challenge during the commercialisation process of product innovation.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Impact</th>
</tr>
</thead>
</table>
| Marketing                                     | -Fail to build national and international sales and distribution channels  
- Fail to access, gather and exploit market and customer information                                                                                                                                       | -Commercialisation process took more time than estimated  
- Schedule delays due to the time-consuming market launch phase  
- Difficulties to find motivated and reliable business partners for internationalization               |
| Resources                                      | -Fail to acquire and allocate internal and external resources during the commercialization process especially within the region  
- Insufficient managerial and industrial business experience available at the regional level                                                                                                          | -Difficulties to plan the required resources (e.g. engineering and financial) for the commercialization process of product innovation.  
- Cost overruns due to the relatively modest progress to bring the new innovation into market        |
| Business environment                          | - Availability and content of support and development services provided by local innovation system  
- Limited number of the potential regional, national and international business partners during the commercialization process                                                                 | -Difficulties to get public funding due to the complexity of the terms and decision criteria  
- Availability of the experienced individual to support the commercialisation process                |
| Planning & Management of the commercialisation process | - A systematic model for commercialisation process of product innovation was missing  
- Lack of time and resources for applying public funding  
- Limited knowledge of the commercialization process requirements and activities                                                                                                                                       | -Difficulties to manage and control the commercialisation process  
- Unfavorable changes and cost overruns during the process due to the lack of knowledge in terms of commercialisation process |

Table 1. The challenges during the commercialisation process of product innovation
The characteristics of small and medium-sized firms and the background of the entrepreneur should be identified when planning and developing innovation support services (see also Pellikka & Virtanen 2009). The lack of business know-how was discovered as the major deficiency of competence in the case firms. This could be alleviated by fostering and supporting the development of entrepreneurial teams with a different background of expertise (technology-orientation vs. market-orientation). Networking and active interaction with partners (e.g., suppliers, customers, universities, and public agencies) during the commercialization process is essential to ameliorate the competence of the ventures. Open innovation approach and close collaboration with customers provides real-time feedback that could be exploited in product development and marketing. That is why networking among small and medium-sized firms and their stakeholders should be one of the major goals of local policy-makers.

The results of the study also show that as part of the regional innovation system, the commercialisation environment of a region plays a key role in commercialisation processes among technology-based SMEs (see also Rosenbloom 2007). The commercialisation environment in the region (defined here as the region’s infrastructure related to commercialisation including the business infrastructure, institutional arrangements, resources and knowledge-intensive services) can play an important role in fostering commercialisation in small technology firms. Notably, the sources of knowledge, such as the private and public organisations in the region, form a technological infrastructure which can promote, for example, transfer of crucial knowledge for the commercialisation process (Oakey 2007). From this perspective, external knowledge is an important input in the commercialisation process. This also means that, at least in the small and medium-sized firm context, the regional collaboration associated with commercialisation processes seems to be even more important than suggested in previous studies.

However, regional collaboration and networks are not always suitable for small technology firms due to the limited knowledge that may be locally available regarding innovation activities and commercialisation. Thus, according to van Geenhuizen (2007), there might be a need to complement the regional innovation system by additional knowledge from other regions. Further, the size of an area may be a significant factor, since it affects the agglomerative economies that can be obtained through access to networks of other firms and organisations in the region (also Pellikka & Malinen, 2011).

In addition, regional studies of high technology sectors suggest that networks of firms are crucial sources of new product ideas and knowledge that can contribute to innovation and competitiveness (van Looy et al. 2003). The small technology firms examined in this study used networking not just for generating ideas but also for other phases of the commercialisation process (e.g. business concept design, market launches, business development and maintenance). Thus, networking increases the flow of information and sharing of resources between organisations during the commercialisation process, and the results of this study indicate that these factors are especially important for small technology firms.
Conclusions and implications

According to Schilling (2008), a firm operating in a high-technology field needs: 1) in-depth understanding of innovation dynamics, 2) a well-crafted innovation strategy, and 3) well-designed processes for innovation. All of these are essential for the effective exploitation of innovation. Indeed, particularly in high-technology sectors, innovations provide foundations for the emergence of new technology-based firms (e.g. Clarysse et al. 2005), and sound innovation strategies may increase small and medium-sized firms’ knowledge acquisition capabilities and strengthen their efforts to develop and commercialise new technology-based products. In addition, to remain competitive, firms need to take advantage of new technological opportunities swiftly in order to provide their customers with new products or services and to respond to changes in customer needs and tastes (also Dodgson 2000; Kaufmann & Tödtling 2002). Increased competition, shortened product life cycles, continually changing customer needs and tastes, and growing technological opportunities to serve customer needs explain the increasing importance of commercialisation of product innovation among SMEs.

Since innovation has become an increasingly important source of competitive advantage, and business investment in R&D and innovation has risen, innovative firms have become increasingly dependent on external sources of knowledge rather than in-house research. Intensified competition, shorter product life cycles and expanded technological opportunities force them to innovate more quickly and focus their R&D expenditures, while seeking privileged and rapid access to complementary new knowledge in the public and private sectors. A result of these driving forces has been the emergence of a new type of organisation of industrial research that is less centred in individual firms, based more on networks and markets, and in some cases, is more reliant on small technology firms. Such inter-organisational collaboration can provide a strong basis for the generation and commercialisation of innovation, and provide other potential benefits, such as facilitating access to new technology and entry to new markets through licensing (Chiaroni et al 2008).

In addition, rather than relying on internal resources for processes such as commercialisation, firms are increasingly participating in ‘open innovation’ (see Chesbrough 2003), i.e. active innovation-related collaboration between business partners, which may help firms to realize the value of new products, e.g. by acquiring technologies from external sources (Lichtenthaler 2008). Therefore, potential challenges may be overcome by the creation of partnerships with external technology providers and other partner companies including small technology firms, universities and science parks – that can all contribute specific competences and technological assets to the commercialisation process in high technology industries.
The major implications of the study for the different stakeholders are summarized below:

- Managers of SMEs to overcome the resource-related challenges during the commercialization process by networking and active interaction with appropriate partners (e.g. suppliers, customers, universities, and public agencies) to support e.g. marketing and internationalisation of the business. In addition, based on the results and the previous studies (see e.g. Pellikka 2009) an appropriate framework (incl. both internal and external part) may help SMEs to more efficiently and systematic manage all the essential parts of commercialisation process i.e. internal activities and inter-organizational collaboration and relationships (external activities).

- Venture capitalists to take care of the own expertise and hands-on capabilities in marketing and internationalisation. In addition, venture capitalists may also help SMEs to foster and support the development of entrepreneurial teams with a different background of expertise (technology-orientation vs. market-orientation).

- Local business developers, universities and education institutions to educate and train skilled employees for the commercialization process of innovation. It is for example important to ensure the availability of the skilled resources in terms of requirements of the commercialisation.
REFERENCES


