# COMMERCIALISATION IN THE SMALL FIRM: SOME FINDINGS FROM SELECTED OECD COUNTRIES

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Paper presented at *Future of Work and Organisations*, 25th Annual ANZAM Conference, 7-9 December 2011, Wellington, New Zealand.

# SMALL FIRM COMMERCIALISATION: FINDINGS FROM A NUMBER OF OECD COUNTRIES


## ABSTRACT

*Commercialisation is one of the most important areas of innovation, but remains poorly understood from a small business perspective. This paper draws on a multi-country sample of small firms in several advanced economies that are engaged in the commercialisation of innovation. It examines their approach to commercialisation so as to understand the relationships between innovation management processes and success in bringing new products to market. A number of aspects of this process were found to be related to commercialisation success. These findings and their implications for policy and practice are discussed in the present paper.*



**Keywords:** commercialisation, small firms, OECD countries, new product development, innovation


## INTRODUCTION

Commercialisation is a poorly defined subject that is generally associated with the process of taking a new product to market and marketing and selling, or licencing the product or associated technologies. According to Chakravorti (2004), the process involves the commercial exploitation of an investment that has been made in an innovation, hopefully resulting in a profitable return for that investment. Commercialisation is a key area within the wider innovation arena, but one that has not been given a great deal of attention (Adams, Bessant and Phelps 2006). However, Akgun, Lynn and Byrne (2004) noted that, while commercialisation has not been as extensively studied as other areas, it is well recognised as a critical element in innovation success.

This paper explores the nature of commercialisation in small firms from a sample of 11 countries within the 34 advanced economies that make up the Organisation for Economic Co-operation and Development (OECD). A small firm is defined as one that employs fewer than 250 employees and has an annual turnover of less than €50 million (OECD 2004). While the commercialisation of innovations, such as new products, has been typically associated with high technology firms, our study examines a wider range of small firms. The OECD (2010) has noted that much attention has been given in past studies to understanding the dynamics of the "Silicon Valley Business Model".

However, while such firms are important, they are only a small proportion of the small to medium sized enterprises (SMEs) that typically include more than 90 percent of all businesses in most OECD economies. What is needed is a better understanding of the process of innovation management within the mainstream small firm sector. Consequently, this study attempted to provide additional information about the nature of commercialisation practices within small firms regardless of their level of technological intensity.

## INNOVATION MANAGEMENT AND COMMERCIALISATION

In a review of past research Adams *et al*. (2006) identified seven key areas relevant to the measurement of innovation management, namely the firm's inputs, management of knowledge, innovation strategy, culture, management of their portfolio of innovations, ability to manage projects and commercialisation processes. Commercialisation is the final stage of the innovation process and the one that has the greatest focus on marketing in a formal sense. It should not be confused with new product development (NPD), which is a separate but related process that precedes commercialisation. NPD is a process that takes products through a pipeline from concept development, prototype, business case analysis, beta testing including initial market assessment, and technical development for full production (Deeds, Decarolis and Coombs 2000). Most commercialisation research has focused on the large firm. For example, Cooper, Edgett and Kleinschmidt (2004a, b, c) found such firms gain from adopting formal approaches to the management of their R&D portfolios and NPD and commercialisation processes. Of particular importance is the support and leadership shown by senior managers, as well as the openness of communication between project team members and the use of cross-functional teams (Brown and Eisenhardt 1995).

Marketing plays a critical role in the commercialisation process, in particularly the need to listen to the 'voice of the customer' (Griffin and Hauser 1993), and the gathering of market research and intelligence during the NPD phase (Huang, Soutar and Brown 2002). While NPD is primarily about process controls within projects, documentation and change control; commercialisation is about product strategy, customer engagement, technological leadership and strategic goal setting (Dooley,

Subra and Anderson 2002). Commercialisation is a process of implementation of an innovation strategy and is the end stage of a complex pipeline of innovation management. Small firms seeking to commercialise new technologies have a range of potential options, including licensing, consulting, collaborative engineering and joint ventures, in addition to direct sales to customers (Adams *et al.* 2006; Libaers, Hicks and Porter 2010). This need to collaborate, often with larger firms occurs because SMEs often lack the necessary resources to commercialise an innovation alone (Kollmer and Dowling 2004).

As already noted, there has been little research into the process of commercialisation in small firms, which has tended to focus on the need for high technology small firms and new business start-ups to partner with larger firms (e.g. Alvarez and Barney 2001; Gans and Stern 2003; Lee, Park, Yoon and Park 2010). Attention has also been given to the inter-relationships between universities as R&D centres and SMEs (Milton-Smith 2001) or the focus small firms can put on licensing as a proxy for innovation commercialisation due to their size (Kollmer and Dowling 2004). It should also be noted that, within large firms, the formality in the NPD and commercialisation process seems to be less important than the way in which such formal systems are implemented (Cooper *et al.* 2004c).

Of importance is the role played by tacit knowledge, particularly within the marketing process. Small firms typically have strong and personal links with their leading customers during the commercialisation process (Grönroos 1994) than larger firms that have strong brands and professional sales and marketing teams (Koskinen and Vahnaranta 2002). High technology SMEs also need to develop effective marketing skills and competencies in developing markets (Pellikka and Virtanen 2009). The process of commercialisation within small firms is usually less systematic and formal than that found in larger firms that often have separate R&D, NPD and marketing teams (Griffin and Hauser 1996; Dutta, Narasimha and Rajiv 1999). By comparison, small firms are characterised by an opportunistic, informal and idiosyncratic decision making process that is often determined by the decision making of one or more key entrepreneurial managers (Blois and Carson 2000; Carson 1985; 1990).

Formality in the commercialisation process has been identified as beneficial to success in large firms (Boag and Rinholm 1989). However, a small firm is typically led by one or two entrepreneurs who build their NPD and commercialisation process around a combination of their own creativity and experience and the feedback they receive from their lead customers (Gibb and Scott 1985; Eng and Quaia 2009). The same pattern emerges in relation to the use of strategic alliances within the commercialisation process. Such alliances are often an essential, albeit challenging, strategic tool for small companies seeking to commercialise new products and services (Kotabe and Swan 1995). However, rather than being strategic and methodical in their approach to alliances for NPD and commercialisation, small firms are generally reactive and opportunistic (Lindman 2002). Unsurprisingly the differences between the small and large firms' commercialisation are their formality and systems. Large firms approach the task with formal and systematic methods targeted at market expansion strategies supported by product and process innovations. By contrast, small firms are more likely to focus on new products and the securing of intellectual property rights through patents, and to view process innovations as a way to lower production costs (Vaona and Pianta 2008).

Although research into small firms' commercialisation practices is scant, three recent papers provide some insights. Terziovski (2010) has suggested a more formal approach to NPD and strategy were better predictors of success than relationships with customers and suppliers or the firm's culture and climate for innovation. By contrast, Liao and Rice (2010) found customer and market orientation were key predictors of success. Finally, Raymond and St-Pierre (2010) found differences between high and low tech sectors, with high-tech gaining more benefit from investments in new product innovation, while low tech firms gained more benefit from process innovation investments.

On balance, the emerging evidence is that small firms are likely to be more informal in their approach to commercialisation and such firms are likely to benefit from investments and greater formality in their approach to NPD, innovation strategy and the systematic exploitation of customer and market opportunities. However, the picture remains unclear as to how this process might work in small firms. To address these issues and investigate the nature of these relationships the present study examined the following hypotheses:

*H1. That formality of innovation management practice is positively associated with success in commercialisation in small firms.*

*H2. A systematic approach to marketing management is positively associated with success in commercialisation within small firms.*

*H3. A systematic approach to strategic management is positively associated with success in commercialisation within small firms.*

*H4. A systematic approach to innovation management is positively associated with success in commercialisation within small firms.*

*H5. A systematic approach to resource management is positively associated with success in commercialisation within small firms.*

## METHODOLOGY

The study used data collected from a sample of 531 small firms in 11 OECD countries. Data for each SME was collected using a questionnaire administered face-to-face and from in-depth follow-up interviews with the senior management of the firm, usually the owner-manager or executive director or managing director. Firms were identified through an investigation of innovative companies in each country, many of which were listed in government or industry databases. In some cases contacts were made through technology incubators and simple networking by the investigators. The data collection involved the use of a case study survey methodology (Yin and Heald, 1975). A common discuss protocol and questionnaire were used across all countries , as was a computer based questionnaire running in EXCEL that allowed the data to be entered during the interview and discussions to take place with the firm's managers at the same time. While this process was time consuming, it allowed for a more in-depth examination of the issues and included some opportunity to validate responses through an examination of the products and product brochures with those interviewed. In the present study, the data that were analysed were obtained from the questionnaire, although the in-depth data allowed additional insights to be obtained from these results.

**The Sample**

The sampling process was purposive rather than random and involved direct approaches to each firm's senior management to secure agreement to undertake the interview. All responding firms had to have an innovation under development that they were planning to commercialise in the three years after the interview.

**<INSERT TABLE 1 HERE>**

Table 1 lists the countries from which the sample was drawn, as well as the proportion of firms from each of the OECD countries and the proportion of firms within each country that were engaged in manufacturing or other sectors. It also lists the proportion of firms in each country that were micro, small or large in size. It can be seen that some countries were mostly represented by micro-enterprises, while there were also differences in industry types. For example, the Belgium firms were recruited from the Flemish creative industries sector, while those from Italy were recruited from the Milanese clothing industries. While all firms were involved in commercialisation, 70 percent were new product innovations, 16 percent were process technology innovations and the rest were a mix of marketing, market development and administrative innovations. Respondents were predominately male (88%) and the majority (81%) were executive managers with either all or some shareholding in the firm; the others were executive managers without shareholding. Most firms (93%) had past experience, commercialising at least one innovation within the three years prior to the interview. Some firms had commercialised between 6 and 10 innovations (19%), while 23 percent had commercialised more than 10. The average age of these firms was 23 years, with a range from 3 months to 167 years. The average number of full time employees was 42 and average gross turnover was around €10.6 million.

**The Conceptual Framework and Measures**

A conceptual framework drawing on Tan *et al.*'s (2009), Tidd's (2001), Cooper *et al.*'s (2004) and Adams *et al.*'s (2006) examinations of innovation management guided the design of the questionnaire,

as was research undertaken by Mazzarol and Reboud (2005; 2006; 2008) and Reboud and Mazzarol (2006). This research suggested three primary perspectives that examined systems and organisational and individual views.

Respondents were asked to indicate how many innovations they had successfully introduced to market within the past three years. As can be seen in Table 2, most had some success, with 23 percent reporting over 10 successful innovations within the time period. This item was used as a measure of success in commercialisation. Firms with no previous success in commercialisation were not included due to their small numbers and to control for firms with no prior track record of commercialisation, which led to the retention of 493 firms (93% of the sample). This resulted in the identification of three groups with low, medium and high levels of success in commercialisation.

**<INSERT TABLE 2 HERE>**

The independent variables were obtained from 40 items relating to the firm's management of marketing, innovation, resources and strategy that were drawn from the "*Innovation Diagnostic Diamond"* (IDD) framework developed by Mazzarol and Reboud (2006) that measured the formality of the firm's NPD and commercialisation processes. The IDD had four indices that measure market, innovation, resource and strategy, each of which is measured through ten items 5-point scales that range from in not at all (1) to completely (5). The "Market Index" items, which are shown in Table 3, focus primarily on whether the firm has undertaken a systematic approach to researching the market, evaluating customers' likely reactions to the innovation and moved through stages that have been identified as important to successful innovation diffusion (Rogers 1976; 1995). It is worth noting that, while most of these items had relatively high scores (e.g. above 3), the highest was the item that asked whether the firm had identified a customer ready to adopt the innovation (mean = 4.23). This is evidence of the customer driven nature of innovation, NPD and commercialisation in many SMEs.

**<INSERT TABLE 3 HERE>**

The “Innovation Index” asks how well a firm has addressed its intellectual property (IP) rights protection, as well as the existence of a formal approach to NPD and the active engagement of customers and employees in the NPD/Commercialisation process. As can be seen in Table 4, there was a strong overall response to the issue of whether the generation of new innovations was a major focus for the firm (mean = 4.14). It can also be seen that the active involvement of employees in the innovation process was also highly rated (mean = 4.40). There was also fairly strong claims for having past experience of commercialisation (mean = 4.00) and the active involvement of customers in NPD (mean = 3.83). However, there was less evidence of formal IP rights management behaviour, particularly in the form of patent registrations (mean = 2.67).

**<INSERT TABLE 4 HERE>**

The “Resource Index” measures the extent to which a firm has sufficient resources to commercialise an innovation, whether the firm has a board that provides strategic advice and guidance and whether it has sought external assistance, such as from government schemes designed to assist SMEs with commercialisation. As scan be seen in Table 5, respondents generally felt confident that they could generate a prototype with their existing resources (mean = 4.14) and that they knew how to find outside expert assistance if required (mean = 4.18). However, there was much less agreement with the other “Resource Index” items. Few had identified venture capital sources (mean = 2.45) or had explored government assistance programs (mean = 2.99). These findings suggest many of these SMEs were seeking to commercialise their innovation alone and had not sought outside assistance from financiers or government agencies.

**<INSERT TABLE 5 HERE>**

The “Strategy Index” measures a firm’s approach to formal strategy formulation and business planning. As can be seen in Table 6, it looks at whether a firm has a formal, written business plan for the innovation it is trying to commercialise, and whether it has considered the key issues Porter (1980) identified as important to the analysis of competitive markets when seeking to develop future strategy. Many of these items were around the midpoint of the rating scale (e.g. 3.00). A comparison of the

combined mean scores for each of the four IDD indices found the "Strategy Index" was the lowest, while the "Market Index" was the highest and the "Resource Index" and "Innovation Index" shared equal second place.

**<INSERT TABLE 6 HERE>**

**Examining group differences**

As there were more than two groups and a large number of potential differentiating factors, discriminant analysis was used to examine the differences between the three groups of firms (low, medium and high commercialisation success) in a multivariate way (Soutar & Sweeney 2003). The independent variables in this case were the IDD framework's 40 items that were discussed in the previous section. Respondents who had not answered all of the questions were not included in the discriminant analysis, which resulted in 444 firms being included (243 low success firms, 94 medium successes firms and 107 high success firms). An initial examination of the univariate differences between the three groups found many significant differences across the 40 items, suggesting a discriminant analysis was likely to be worthwhile. Consequently, the stepwise discriminant analysis procedure within the SPSS statistical software package was used to assess these differences

The two functions, which the I-squared statistic (Peterson and Mahajan 1976) suggested explained 23% of the variation between the groups, were both significant at the 5% level and, using the F-statistic between the groups as an indicator, each of the groups was significantly different from the other two groups well beyond the 1% level. Consequently, the two functions were retained and the results obtained are shown diagrammatically in Figure 1. Following Soutar and McNeil's (1995) approach, the larger structural correlations (greater than 0.40) between the discriminant functions and the relevant survey items were drawn as vectors. The lengths of these vectors indicate their relative importance, while their directions show the nature of their relationship with the estimated discriminant functions. The group centroids were also placed in the space, as their positions provide insight into the differences between the groups.

**<INSERT FIGURE 1 HERE>**

As can be seen in Figure 1 there were differences between the three groups, with highly successful firms being more likely to have a formal NPD process, past experience with commercialisation and an ability to develop a prototype without outside assistance, although they also were more likely to have explored government assistance programs. Along with the medium success firms, they were also more likely to have the financial resources to proceed with commercialisation without external help. The medium success firms also characterised had new innovation as a key strategic focus, while firms with less success were less likely to have the resources needed and less likely to have formal process, bur, along with the medium success firms, they were more likely to have formal IP rights registration as measured by patents.

## DISCUSSION

The present study suggests successful commercialisation activity is associated with more formal processes, especially NPD process, as well as past commercialisation experience, the competence to develop a prototype alone and the financial resources needed to proceed with the commercialisation. Further, firms with a strong commitment to innovation and NPD were also more likely to have been successful. The use of formal IP rights did not seem to be related to such success, and firms having experienced success didn't seem to have used the assistance their governments had made available for them. It was also notable that most of the differentiating items were drawn from the Innovation Index, while the rest came from the Resource Index. This appears to reflect firms have a more operational focus in their commercialisation, as both Strategy Index and Market Index include elements of global analysis and strategic competencies.

This largely operation rather than strategic nature of the commercialisation behaviour of small firms has been noted by others (e.g. Vaona and Pianta 2008; Terziovski 2010). A lack of focus on strategic planning and marketing issues by small firms engaged in commercialisation was noted by Lindman (2002) who attributed it to the entrepreneur’s reliance on feedback from lead customers rather than formal market assessments in determining future commercialisation decisions.

What emerged from the study is a picture of successful small firm commercialisation, characterised by firms with management teams that have past experience in NPD and commercialisation, the technical skills to develop prototypes and the financial resources to move forward alone. These firms seem to have developed formal NPD processes through their past experience of successful commercialisation that are likely to enhance their capacity to commercialise successfully. These firms are committed to innovation and see it as a major focus for their business. They may seek government assistance and apply for formal patent protection of IP rights, although not all are likely to do so.

The absence of formal strategic planning and marketing highlights Gibb and Scott's (1985), Carson's (1985; 1990), Blois and Carson's (2000) and Koskinen and Vahnaranta's (2002) research that pointed to the close relationship between the entrepreneurial manager of small innovator firms and their lead customers. Commercialisation decisions seem to be opportunistic, informal and idiosyncratic, yet based on experience and an intimate knowledge of what customers want or will buy.

## CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH

The process of commercialisation within small firms has not been comprehensively examined in prior research. The present study sought to shed additional light on the topic and our findings suggest the process is more operational than strategic and that it is more about the management of innovation and resource allocation issues than a systematic review of the market, combined with formal strategic planning. Our study has some limitations, however. As the present study used cross-sectional data, longitudinal case studies may be a fruitful way to explore what small firms actually do in this area and why in more detail.

Although the formal elements of marketing and strategy were not strongly associated with successful commercialisation, we should not assume they do not play a role. Many small firms are led by entrepreneurs who have a deep knowledge of their industry sector, market and, in particular, their lead customers. Such knowledge is a good substitute for formal market analysis and strategic planning. So long as the entrepreneur continues to operate within the boundaries of their experience set, they are likely to be successful. However, if they move outside these boundaries this may not be true.

Policy makers seeking to boost small firms' innovation and commercialisation need to recognise that many entrepreneurs possess expertise in NPD and the project management skills associated with it. Where they have pre-existing customer relationships and the technical and financial resources to proceed with commercialisation alone, they may find formal analysis of the market, technical and financial elements of the business case of little interest.

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Table 1: Country of Origin and Sample Characteristics (N = 531)

| Country | % of Firms | Manufacturing (%) | Non-Manufacturing (%) | Micro (<9 employees) (%) | Small (10-49 employees) (%) | Medium (50-249 employees) (%) |
|---|---|---|---|---|---|---|
| Australia | 15 | 33 | 67 | 45 | 40 | 15 |
| Austria | 14 | 29 | 71 | 52 | 32 | 16 |
| Belgium | 10 | 2 | 98 | 92 | 8 | 0 |
| Canada | 9 | 68 | 32 | 15 | 11 | 74 |
| France | 13 | 27 | 73 | 38 | 29 | 33 |
| Germany | 1 | 100 | 0 | 0 | 0 | 100 |
| Italy | 2 | 75 | 25 | 17 | 33 | 50 |
| New Zealand | 17 | 40 | 60 | 7 | 42 | 51 |
| Spain | 2 | 90 | 10 | 20 | 0 | 80 |
| Switzerland | 12 | 25 | 75 | 5 | 43 | 52 |
| United States | 5 | 8 | 92 | 62 | 31 | 7 |

Table 2: Innovations introduced to market in the past three years

| | Frequency | Percent | Cumulative Percent |
|---|---|---|---|
| None | 38 | 7 | 7 |
| 1 to 5 | 267 | 51 | 58 |
| 6 to 10 | 102 | 19 | 79 |
| More than 10 | 124 | 23 | 100 |
| Total | 529 | 100 | |

Table 3: Innovation diagnostic diamond – Market Index

| MARKET INDEX MEASURES | Mean Score |
|---|---|
| Have you fully researched the benefits perceived by the customer for this innovation? | 3.70 |
| Have you fully explored the most appropriate pricing strategy? | 3.56 |
| Have you researched how easily customers will understand it? | 3.72 |
| Have you researched how easy it will be for customers to trial prior to adoption? | 3.67 |
| Have you researched how easy it will be for customers to do post adoption evaluations? | 3.41 |
| Have you fully explored how compatible it is with customers' existing technologies/systems? | 3.98 |
| Have you fully examined customer perceptions of risk and cost? | 3.43 |
| Have you fully explored the opportunities it offers customers? | 3.97 |
| Have you previously collaborated with customers over innovations? | 3.75 |
| Have you researched if there is already a customer ready to adopt this innovation? | 4.23 |
| Scale ranges from not at all (1) to completely (5)<br>Cronbach's Alpha = | **0.84** |

Table 4: Innovation diagnostic diamond – Innovation Index

| INNOVATION INDEX MEASURES | Mean Score |
|---|---|
| Do you have a formal process for new product development? | 3.46 |
| Do you feel the generation of new innovations is a major focus of your firm? | 4.14 |
| Do you feel you could fully develop the prototype technically without outside assistance? | 3.44 |
| Are you confident the innovation has been independently tested or evaluated? | 3.36 |
| Have you fully explored with an intellectual property lawyer or patent attorney the IP management issues associated with the innovation(s)? | 3.08 |
| Does your innovation have legally protectable patents in-place or pending? | 2.67 |
| Do you use confidentiality agreements before showing your ideas to others? | 3.52 |
| Have you previous experience of commercialisation of your innovations? | 4.00 |
| Do you actively involve customers in developing your new innovation(s)? | 3.83 |
| Do you actively involve employees in developing new innovations? | 4.40 |
| Scale ranges from not at all (1) to completely (5)<br>Cronbach's Alpha = | **0.70** |

Table 5: Innovation diagnostic diamond – Resource Index

| RESOURCE INDEX MEASURES | Mean Score |
|---|---|
| Do you already have the technological resources to create a prototype? | 4.14 |
| Do you have the competencies to fully commercialise the innovation alone? | 3.70 |
| Do you have an experienced project management team to work on the idea? | 3.79 |
| Do you know how to find external expert assistance if required? | 4.18 |
| Are staffing resources adequate for the future development of the idea? | 3.45 |
| Are physical resources adequate for the future development of the idea? | 3.84 |
| Are financial resources adequate for the future development of the idea? | 3.50 |
| Have you fully explored government assistance programs designed to help small firms with commercialisation? | 2.99 |
| Have you identified sources of venture capital financing for the innovation? | 2.45 |
| Do you have a management board to provide guidance and advice? | 3.72 |
| Scale ranges from not at all (1) to completely (5)<br>Cronbach's Alpha = | **0.68** |

Table 6: Innovation diagnostic diamond – Strategy Index

| STRATEGY INDEX MEASURES | Mean Score |
|---|---|
| Do you have a formal, written business plan for your innovation? | 3.40 |
| Have you fully assessed the bargaining power of your customers? | 3.43 |
| Have you fully assessed the bargaining power of your suppliers? | 3.29 |
| Have you fully assessed the threat of alternative technologies to yours? | 3.66 |
| Have you fully assessed the reaction of competitors to your innovation? | 3.33 |
| Have you fully assessed the reaction of complementary partners able to assist you? | 3.20 |
| Have you considered existing or anticipated government regulations? | 3.38 |
| Have you secured all necessary compliances and authorisations? | 3.93 |
| Have you undertaken a risk assessment in the light of potential threats? | 3.32 |
| Have you completed a comprehensive financial model | 3.35 |
| Scale ranges from not at all (1) to completely (5)<br>Cronbach's Alpha = | **0.80** |

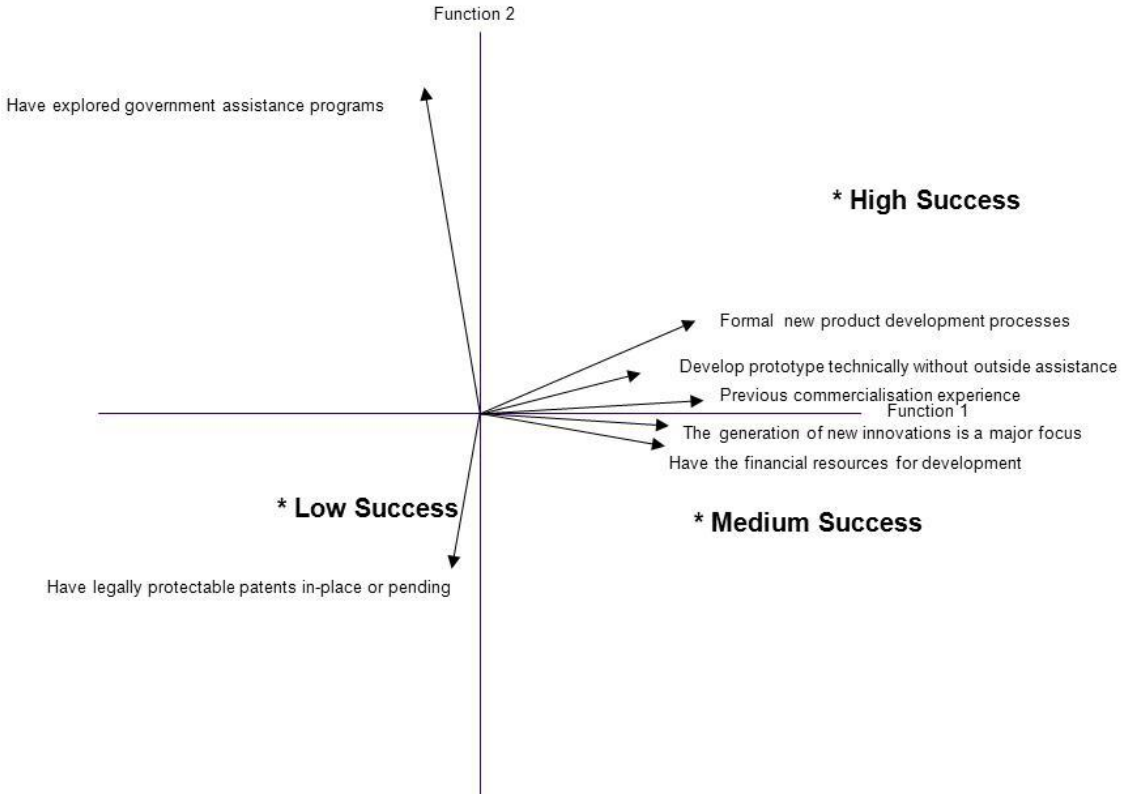


Figure 1: Innovation Success Groups – Innovation Diagnostic Diamond Differences