

**Taking a Strategic Approach to Innovation in Small Firms – the application of
a diagnostic assessment tool**

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Refereed Paper Non-Refereed Paper

STREAM: Technology & Innovation Management

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ABSTRACT

The paper outlines the design, development and application of a diagnostic assessment and screening tool for entrepreneurs of small firms engaged in early stage commercialisation of new technologies. This tool examines the commercialisation readiness of the small firm with attention given to marketing, resources, innovation management and strategic planning activities. It also examines the proposed innovation and assesses it against one of six generic innovation configurations. The findings from eight case study firms are discussed along with the benefits of using such a screening tool.

Keywords: Small firms; Innovation; Commercialisation; Case Studies; Diagnostic Assessment..

INTRODUCTION

For small firms (e.g. those with less than 100 employees), the ability to assess risk and evaluate potential returns is frequently difficult. Due to the potentially disruptive nature of innovation it is an activity containing inherent risk, with uncertainty in future technical, commercial and financial returns to the initial investment required (Catignon and Robertson 1993; Dziura 2001). An important consideration in the decision to invest in future innovations is therefore the trade off between risk and return. Despite the importance of small firms to enhancing innovation, it remains difficult for the entrepreneurs associated with such businesses to fully assess the relative merits of their innovation in relation to risk-return trade offs. Successful diffusion of an innovation frequently involves consideration of a range of variables associated with market forces, including the relative power of competitors, suppliers and customers and regulatory agencies. For most small business operators, the evaluation of these many factors remains complex and difficult. Thus an evaluation tool designed to assist owner-managers of small firms assess the merits of their innovations is likely to be of significant value. Prior to the launch of a new product or process attention needs to be given to the potential return likely to accrue from the investment and this will require a systematic approach to screening new opportunities. Traditional financial models (e.g. Net Present Value) can offer a guide to the potential attractiveness of an innovation, but these have limitations in terms of their ability to fully assess the true risk-return associated with the project. To address this problem a risk-return model has been developed to provide a quick screening tool for small firms (Reboud and Mazzarol, 2004; Mazzarol and Reboud, 2005). This paper outlines the development of such a tool and profiles its application to a group of early stage commercialisation case studies.

INNOVATION IN THE SMALL FIRM

As small firms grow, they must introduce new products, processes, and management changes and acquire new systems and markets, all of which can be viewed as innovative activities (Gibb, 2000). Small firms that possess innovative orientations are more likely to emulate the autonomous, multi-disciplinary project teams that are often difficult to generate within larger organisations (Perry, 1995; VanDenVen, 1986). However the attitude and orientation of the entrepreneur is the key to innovativeness within the small firm (Chandler, Keller and Lyon, 2000). The possession of a strong market orientation that enables a firm to closely monitor and respond to the needs of customers has been recognised as a key element in the successful development of innovation (Quinn 1985). Entrepreneurs within small firms typically enjoy close relationships with their customers and benefit from adapting to customer feedback with innovation (Vossen, 1998). Strategic networking with other firms within their industry can also enhance the innovativeness of small firms (De Propis, 2000).

Successful innovators establish strategic partnerships within their industry supply chain, developing close relationships with lead customers and key suppliers, as well as third-party “resource network” partners such as banks, venture capital suppliers and providers of new technology (Holmlund and Tornroos 1997; Cook and Wills, 1999). Miller (2001) argues in favour of closely engaging with customers and suppliers to examine needs and possibilities in what has been described as a Fourth Generation (4G) spiral process for innovation (Miller and Morris 1999). Performance in terms of successful commercialisation outcomes within small firms is also associated with both technical and market development processes, and the presence of a formal system of new product development (Huang, Soutar and Brown, 2002). The way such firms are structured and their organisational culture can play an important role in their success (Perry, 1995; Mazzarol 2002). However, the most important element within the small, innovator firm is usually the entrepreneur (Hadjimanolis, 2000). Of particular importance is the management competency of the entrepreneurs who own and operate such small firms (Jones-Evans, 1996).

Entrepreneurs managing small innovator firms must not only focus on the needs of customers and their chosen markets, but they also need to formulate strategies that can apply their often limited resources into the best configuration to exploit the innovations that they have created (Smallbone, Leigh and North, 1995; Sandberg, Robinson and Pearce, 2001). This need to balance the strategic direction of the firm and market opportunity against the usual resource constraints is a major challenge for most small business entrepreneurs (Mazzarol, 2005). For innovator firms the need to protect and manage their intellectual property to best advantage is also a key consideration (Bertolotti, 1995; Herring, 2002).

This suggests the need for the entrepreneur to focus on four key areas: i) the innovation and the new product development process; ii) the market opportunity and customer needs/acceptance of the innovation; iii) the strategy to bring the innovation to market; and iv) the resources needed for the commercialisation process. Research into the strategic decision making behaviour of entrepreneurs from small innovator firms suggests that that short-term, capital intensive innovations are common with firms seeking to secure long-term sustainable returns from future investments (Mazzarol and Reboud, 2005). Firms that report having a formal or systematic approach to new product development or innovation also appear more likely to generate superior innovations from a commercial perspective than their counterparts without such systems (Reboud and Mazzarol, 2004).

EVALUATING RISK-RETURN TO INNOVATION IN SMALL FIRMS

As with many other aspects of how small firms operate, the way an innovating small firm evaluates the risks related to its innovation as well as the way the process of innovation itself is run can be highly idiosyncratic. An important part of the difference relies on the personality of the owner manager of the small firm (Smallbone, Leigh and North 1995; Autio and Lumme 1998) and this can even be a criterion to analyse the behaviour of small business entrepreneurs (Ajzen and Fishbein 1980). The personality of the entrepreneur and the way it influences their decision making in relation to the innovation management process is therefore important. Questions of specific interest might include: Whether or not they use tools to help them make decisions? To whom do they turn for advice? And would their main advisors themselves use a screening tool to help them analyse the situation?

While financial models (e.g. Net Present Value) can offer a guide to the potential attractiveness of innovations, these measures are limited in their capacity to fully assess the non-financial variables likely to impact on the investment, such as the competitive reactions of the environment (Steffans and Douglas, 2004). Moreover the innovator might be convinced of the value of its innovation but unable to analyse it or even prove its reality. There can be three main reasons to explain this. First an innovator often places more emphasis on the anticipated absolute value of the innovation without considering the potential difficulties associated with its launch (Martin and Staines, 1994). This evaluation frequently can be overly optimistic either because the anticipated interest is overestimated or because it does not take into account the erosion of the RENT due to the bargaining power of such environmental actors as suppliers and customers; and due to the effects of competition. Second the innovator may have had an unstructured way of reasoning, thus they may act on an intuition rather than on a rational reasoning (Mockler 2003). This is a high probability among small firms where the owner-manager is relatively isolated and lacks the support of an evaluation team with the skills to conduct appropriate feasibility analysis. Third, the innovation

frequently involves a complex, non-linear process in which feedback over progress is difficult to anticipate. Where firms are engaged in competitive environments for the launch of their new technologies it is possible that such financially based analysis can be distorted by the actions of competitors either over or undervaluing the innovation (Weeds, 2002). A risk assessment tool able to overcome these problems is therefore highly desirable for small firms.

CREATION OF THE SCREENING TOOL

To address this need initial development of a screening tool designed to assist entrepreneurs from small firms to quickly evaluate the risk-return profile of future innovation investment opportunities was commenced (Santi, et.al. 2003). This tool is designed to help an innovator or its advisor to choose an adapted strategic choice for the innovation; to launch or not, to protect or not, to share the innovation with suppliers, customers, competitors, or not. In this paper we will first present the screening tool and its logic and then present the past, current and future analysis of the interest of this tool and its potential use by entrepreneurs from in small firms engaged in commercialisation.

The initial model developed in France measures the anticipated 'RENT' or financial return anticipated from a particular investment in an innovation (Miles, Paul and Wilhite 2003). Traditional Riccardian RENT models have been challenged in terms of their "static" nature and alternative, more "dynamic" approaches suggested based upon a Schumpeterian "entrepreneurial" RENT model (Rumelt, 1974; Mahoney and Pandian, 1992). Managers are likely to experience difficulty in evaluating the potential RENT return from future innovation due to uncertainty over the competitive environments facing them, only when they can more accurately assess future strategic options can appropriate investment decision be made (Barney, 1986).

In order to help the innovator not only to correctly assess the initial anticipated value of its innovation, but also the erosion effects it will face when launched on the market, the process of analysis follows several steps (Santi et al 2003): i) analysis of anticipated rent (the 'potential rent'), related to the kind of innovation and the number and size of the potential using markets; ii) analysis of the characteristic of the environment of the potential using market, and the related erosion effects; iii) analysis of the competitive strengths the innovation will have to face, leaving only a 'residual rent'; and iv) analysis of the competitive situation of the firm and its ability to launch the innovation, able to catch an 'appropriable rent'.

Innovation is in the economic theory a potential source of competitive advantage (Nemeth 1997). The rent associated to this competitive advantage is the condition for its success and further development. An

innovator is thus going to develop a new resource or competence or going to create a new combination of existing resources and competencies (Schumpeter 1934). A firm with a competitive advantage should be able to generate a rate of profit higher than the mean rate of profit in its industry and even more to keep this rate higher during a given period. In many cases of innovation the durability of the advantage can be protected thanks to the patent system. The innovator is then the only legal user of the innovation for a twenty-year period securing a legal monopoly and creating a sustainable competitive advantage. This emulates the concept of Ricardian rent.

Factors likely to assist the entrepreneur to create barriers to the erosion of the competitive advantage created by the innovation and thereby reduce the RENT returns are uncertain include their ability to create “uncertain imitability” around their innovation (Lippman and Rumelt, 1982), which is likely to depend on the complexity, tacitness and specificity inherent in the innovation (Reed and DeFillippi, 1990). The ability of the entrepreneur to generate innovation in such a way that is causally ambiguous through the interconnection of assets and the capacity to achieve time compression diseconomies and be first to market are also likely to enhance their competitive advantage (Dierickx and Cool, 1989). However, the entrepreneur will need to monitor their external market environment closely and ensure that they can overcome business system, management, regulatory and market positional gaps (Coyne, 1986), while taking advantage of those competitive differentials that have been generated by their innovation (Hall, 1992; 1993; Rumelt, 1984).

The first part of the screening tool draws on a model of potential RENT from a future innovation that is a function of three variables: i) **Volume** – as measured by the volume of sales over a year; ii) **Rate** – the profit margin likely to be generated from the innovation; and iii) **Length** – the duration of the life-cycle of the innovation (Santi, et. al. 2003). This can be illustrated in the following model.

$$\text{RENT} = \text{VOLUME} \times \text{RATE} \times \text{LENGTH}$$

In this process the potential returns are influenced by the volume of sales generated from the innovation, its profitability and the length of time that the innovation can be maintained in the market before its competitiveness is eroded by competitors or substitutions. Profitability is a critical issue and is determined by the price-cost relationship of the innovation. As the combination of these three variable components, a rent can be characterised by its extreme profile: large/small volume; high/low rate of margin and short/long life cycle. With two possibilities for each variable the total number of combinations is eight. Prior to introducing the innovation to the market a first step for the small firm would be to analyse the expected amount of potential rent. Measuring the volume, rate and length of the

anticipated rent to be generated by the innovation before any interaction with market forces is therefore a desirable initial stage.

In developing the screening tool the RENT return for the proposed innovation was measured using six items within the questionnaire that encompass: i) two items for volume (market adoption rate and anticipated sales); ii) two items for rate (estimated gross and net profit margin); and iii) two items measuring anticipated length (the complexity of the technical base of the innovation and ease of replication by competitors). Six potential RENT configurations can be identified using this framework (Santi, et.al, 2003)

Each configuration involves different levels of volume, rate and length thereby determining the anticipated rent to be derived from the innovation. These configurations are labelled: ‘Shrimp’, ‘Champion’, ‘Gadget’, ‘Joker’, ‘Flash in the Pan’, or ‘Oasis’ (Mazzarol and Reboud, 2005). These may be further described in the following terms: i) **Shrimp** – a configuration offering low rent potential due to its modest levels of volume, rate and length. As such it is unlikely to be of much interest; ii) **Champion** – a configuration with high potential rent; iii) **Gadget** – a configuration offering low volume and length but high rate, leading to little interest overall. Such a configuration would not justify significant investment; iv) **Joker** – configuration with high volume and length but low rate making it little better than the ‘Gadget’ despite its apparently attractiveness; v) **Flash in the Pan** – a configuration with good volume but poor length and may experience both high or low rate, making it challenging for the investor that may need to outlay substantial capital to secure the return over the short life cycle; and vi) **Oasis** – a configuration that offers good length but low volume and high or low rate.

While the “Champion” configuration appears the most desirable, the “Oasis” configuration may be more suitable for a small firm because the small overall volume of sales may be more readily exploited by the small firm (Santi et. al. 2003). Such an innovation opportunity is essentially that found in a niche market. However, the capacity of the small firm to secure a desirable rent return from its innovation is likely to depend on its resources, the nature of the innovation and the characteristics of the market environment into which it is seeking to diffuse the innovation. Key forces likely to influence the market environment include the power of customers and their capacity and willingness to adopt the new innovation, the power of competitors and the capacity for new market entrants and substitution threats to erode the competitive advantage of the innovation (Porter, 1980).

In addition to the estimation of the potential RENT return an entrepreneur might yield from an innovation, there remains the need for the development of an effective business model to fully commercialise the innovation (Akgun, Lynn and Byrne, 2004). This part of the analysis tool develops an “Innovation

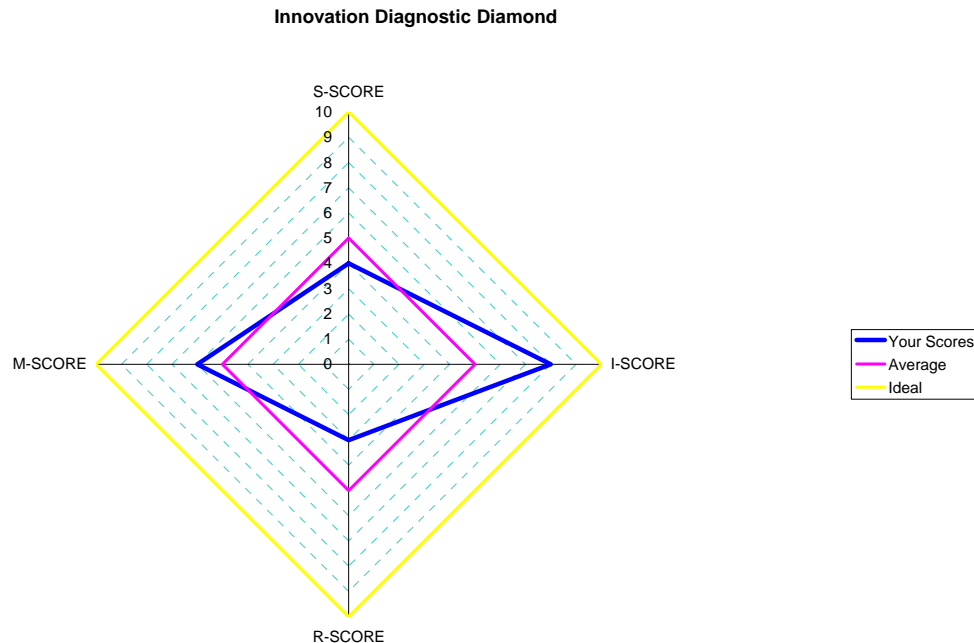
Diagnostic Diamond” that maps a graphic format the performance of the entrepreneur’s current management practices against four Index measures. To address this a four part framework was developed that seeks to measure the small firm entrepreneur’s current approach to innovation management mapping behaviour on four dimensions: i) **Market Index** – a measure of the firm’s focus on customer needs and how the new innovation offers customers value for money; ii) **Innovation Index** – a measure of the firm’s formal process of new product development, and its management of intellectual property (IP); iii) **Resources Index** – a measure of the firm’s technological, human, financial and managerial resources; and iv) **Strategy Index** – a measure of the firm’s strategic planning in relation to its commercialisation process. Each “index” comprises a total of ten items that are scored as YES or NO responses by the entrepreneurs undertaking the survey. Scores could range from 0 to 10 with 5 being the average for each of the four indexes. Where firms scored below 5 it was recommended in the accompanying report that action should be taken.

APPLICATION TO COMMERCIALISATION CASE STUDIES

The screening tool was applied initially at a workshop comprising 16 persons attending a one-day seminar on innovation and commercialisation. Participants completed the screening tool under supervision from the research team and provided feedback on the findings. Following some adjustments to the layout and items in the questionnaire, it was used to provide screening for eight entrepreneurs engaged in early stage commercialisation projects within a management development program run via the university. All eight cases involved significant product or process innovations involving patents or other protected IP. Each of these cases involved a single entrepreneur who was asked to complete the diagnostic assessment tool prior to embarking on the management course, in order to assist in early stage screening of their innovation. At a follow-up workshop the findings from the diagnostic assessments were given back to these entrepreneurs who were then asked to review the findings and participate in a group discussion on what the findings meant and how they might use them to assist in developing future commercialisation strategy.

Assessing the Diagnostic Diamond

The eight entrepreneurs each produced “Innovation Diagnostic Diamond” models with indexes that ranged from 0 to 8 out of 10, indicating how well developed their commercialisation process was. A typical example is illustrated in Figure 1 where it can be seen that while the Innovation Index score was fairly good, the Strategy and Resource Indexes were below average, suggesting areas for improvement.



These findings allowed the entrepreneurs to evaluate their current business practices and consider, with reference to each item within the four Index scales, what further actions were required. As one case study entrepreneur commented in relation to his Strategy Index score: *“I need a more organised approach to securing the innovation, including a formal system of engaging the Board and others willing to be involved”*. This analysis allowed these entrepreneurs to prepare future action plans and discuss them within the context of developing a future business strategy for their commercialisation project.

Assessing the RENT Model

The second part of the analysis tool involved the estimation of the three elements of the RENT model (e.g. volume, rate and length) producing a score out of 10 for each element with a mid-point of 5. Scores above 5 were classified as HIGH while those below 5 were classified as LOW. This allowed each entrepreneur to generate a RENT model for their innovation that conformed to one of the six designated configurations identified in the original research. Of the eight cases one profiled as a “Champion”, one as a “Flash in the Pan”, one as an “Oasis”, four as “Gadgets” and one as a “Joker”. The most common problems identified through this screening and classification process were low rate and length. Low rate (profitability) was found among the “Joker”, “Oasis” and “Flash in the Pan” cases and was typically caused by a lack of confidence in pricing the new product at a premium within the market or excessive production costs. Low length among the “Gadget” and “Flash in the Pan” types was typically caused in most cases by difficulties

associated with protecting the IP and/or defending against substitution threats from competing technologies.

The analysis undertaken by the entrepreneurs via the discussion groups and subsequent individual reporting to the research team suggested that the activity of creating the RENT configuration profile was highly beneficial to helping them develop a strategic view of their innovation. As one entrepreneur commented following the analysis: *“This data enables the innovation to be measured and managed, therefore ensuring its full potential of the innovation can be realised. By using the RENT assessment principles, the research data of market-customer evaluation also enables a valuation to be put on the innovation.”*

DISCUSSION

Case studies provide a useful means of understanding the behaviour of entrepreneurs within small firms (Chetty, 1996), and provide a means of predicting either similar results (literal replication), or to predict results that are different for expected reasons (theoretical replication) (Yin, 1989). In this study the eight cases provided some validation of the usefulness of the diagnostic assessment tool in assisting entrepreneurs from small firms to think strategically about their innovation within an early stage of the commercialisation process. According to Santi et. al. (2003) the smaller firm may not benefit from having a “Champion” configuration as the requirement for meeting large sales volumes may impose too great a burden on its limited production resources. By contrast the “Oasis” configuration may be more suitable. However, in this study the most common type identified was the “Gadget”. There were many reasons for this, most specific to each case. Among the most common cause of a low volume assessment was the lack of any comprehensive market research and analysis by the entrepreneurs. Following the application of this diagnostic assessment all were required to undertake market research activities. In many cases this revealed a significant level of market opportunity beyond what they had originally anticipated. It also led to a redesign of the product and the revaluation of the overall value of the innovation. The low length was generally caused by a relative lack of systematic intellectual property (IP) protection. As with the market research activities, the entrepreneurs were subsequently required to undertake a review of their IP management approach. This led many to adopting major changes in their IP protection systems that built upon the relatively modest starting point of simply registering a patent.

Mazzarol and Reboud (2005) found that small, high innovator firms assessed their RENT returns and decisions to proceed with the innovation by an assessment of the value that the innovation might offer to the customer and how readily the innovation might be adopted by the customer and market. However, a

notable feature of these eight case studies was the lack of adequate market research and analysis or even a clearly identified lead customer or market niche for the innovation. All cases possessed a platform IP that could be applied across multiple market segments, each of which was likely to provide different RENT configurations. A key strategic decision for these entrepreneurs therefore was how to focus their innovation on a particular market segment that would generate the best RENT configuration. This in turn leads back to how ready the small firm was for undertaking the commercialisation process. Each of the four indexes comprising the “Innovation Diagnostic Diamond” can play a useful role in guiding this preparation.

Assessing the Market Index

Market analysis and development is critical to the successful commercialisation of a new innovation. It requires a careful assessment of customer needs and how the new innovation offers customers value for money. Pricing strategies and the ease with which the customer can understand the new idea and adapt it to their existing systems are critical. Customers will often like to trial a new innovation prior to adoption and assess its value post adoption (Rogers, 1995; Frambach and Schillewaert, 2002). Many customers will collaborate with innovators, assisting its commercialisation process (Thomke and von Hippel, 2002).

Assessing the Innovation Index

Innovation management requires a formal process focusing on new product development and the recognition that innovation is a key aspect of the firm’s success (Kemp, Folkeringa, de Jong and Wubben, 2003). Commercialisation requires the development of a workable prototype that can be taken to market, and the protection of the intellectual property (IP) associated with the innovation. Legal protection (e.g. patents, trade marks) is important in securing the value of the IP. Customers and employees can be a valuable source of new ideas for innovation and to assist in the development of innovations.

Assessing the Resource Index

Commercialisation requires resources of a technological, human, financial and managerial nature. Small firms will need to have adequate technological resources to build the prototype and the competencies to take it to market. An assessment of the expertise, staffing, physical and financial resources needed for the commercialisation process should be undertaken (Cooper, Edgett, and Kleinschmidt, 2004). Sources of external funding, such as government R&D grants and venture capital financing, need to be explored and secured. A well-constructed board of directors who can provide advice and guidance should be identified.

Assessing the Strategy Index

Strategic planning is critical to the success of commercialisation. A formal written business plan is an effective way to organise the process of strategic management and will be valuable when small firms seek future external support. This plan should assess the power of customers, suppliers and competitors within the markets targeted by the new innovation (Grupp and Maital, 2001). Where the firm can secure collaborative agreements with complimentary actors it should. The impact of such things as government regulation, compliance requirements and other threats should be examined. A key part of the plan should be the development of a comprehensive financial model for the innovation assessing return.

In the relationship between the RENT configuration and the Diagnostic Diamond there is an expectation that an entrepreneur who has a high score on all four dimensions of the Diamond, will also have a better appreciation of the merits of their innovations, and will be more likely to produce an above average RENT outcome. However, it must be noted that we do not suggest that the RENT outcome is a dependent variable to the Diagnostic Diamond in a direct sense. The two components of the screening tool are complimentary but not co-dependent.

CONCLUSION

This study provides an overview of the development and application of a diagnostic assessment and screening tool for use by small firms engaged in the commercialisation of innovations. The tool offers a simplified and accessible assessment mechanism for entrepreneurs that can serve as a checklist of their firm's commercialisation readiness, and a strategic assessment of the likely returns to investment in the innovation itself. Its usefulness should be considered against the evidence that commercialisation is a multifaceted process requiring consideration of technical, legal, market and financial issues (Tidd, 2001). Entrepreneurs seeking to make future investment decisions relating to innovation are also faced with the problem of inadequate and overly complex financial risk assessment methods (Canibano, Garcia-Ayuso and Sanchez, 2000; Loch and Bode-Greuel, 2001). Non financial measures such as those outlined in this screening tool are also acknowledged to offer significant value to commercialisation management decision making (Vavio, 1999; Cumby and Conrod, 2001).

Although the assessment tool does not provide detailed quantifiable financial measures for the investment this is not its purpose. It is designed as an initial screening mechanism and should be used as part of a wider process of education to assist the entrepreneur to better understand the underlying structure of their innovation and the factors likely to impact on sales volume, profitability rates and the length of time the new product can be held in the market. It is also designed to raise to the entrepreneur's attention the need

to consider their commercialisation process in a holistic manner, which includes market, resources, innovation and strategy as being of equal importance.

The application to a relatively small number of early-stage commercialisation ventures provides some indication of the potential value of this screening tool. However, the study remains exploratory in nature and further use of the tool in a wider range of applications will be required before its robustness can be fully determined. The proposed tool has some limitations in terms of potential sample response bias as it captures the perceptions of the entrepreneurs rather than a “hard” analysis of the innovation itself. To overcome this problem the data collection process should involve a one-to-one interview rather than delivery via post or internet. This may assist in building up the trust between the researchers and the entrepreneur, and will allow the data collectors to explain the importance of honest reporting. However, the entrepreneur’s perceptions of their innovation’s potential might still be subject to bias due to a lack of appreciation of the realities of their market environment. This may cause them to over or underestimate their market opportunities. However, the modest trial undertaken in this study suggests that fairly accurate results can be produced if the entrepreneurs undertake what is being asked of them. It is nevertheless important not to view this tool as a prescriptive screening device. It is most useful as a means of guiding the strategic thinking of the entrepreneur, than determining whether or not to kill a particular innovation. Future research will need to see the tool applied with more cases and in other countries, as well as with a larger number of firms.

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