

Technology Mediation Programs And SME Innovative Activities

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INTRODUCTION

Technology mediation programs sponsored by governments are widely regarded as essential elements of an innovation system, promoting knowledge and technology diffusion and innovation (Asheim 1996; Cooke Hassink 1996). The innovation systems' perspective suggests that the innovative activities of firms are dependent on access to external as well as internal knowledge, from suppliers, customers, universities, public and private R&D agencies and technology mediating organizations (Dosi 1988). However, although governments in developed and developing countries have established and promoted intermediary organisations, the evidence is mixed regarding the effectiveness of these interventions in innovation systems. On the one hand, it has been found that firms, particularly SMEs, tend to rely on internal sources of innovation or supply chain related sources, such as suppliers and customers (Mohannak 2003). On the other hand, it has been argued that the types of assistance provided by intermediary organizations are not always well aligned with the needs of SMEs (North, Smallbone and Vickers 2001). Furthermore, little work has been done to examine the relationship between access to technology mediation and pricing of products. This paper reports on a study of a technology mediation program that is funded by the government and delivered through a specialist business development/R&D support organization in the manufacturing sector in an Australian State. The study explored the relationship between the purpose of the technology mediation program, the types of assistance provided to SMEs and the innovative activities of firms. The relevance of product pricing to take up of this type of innovation assistance was also examined. The results of the study point to the importance of government-sponsored technology mediating programs for SME innovation. However, a number of issues were also identified relating to the focus of the program and the pricing of the products.

TECHNOLOGY MEDIATING ORGANIZATIONS AND SME INNOVATION

Government sponsored technology mediation initiatives directed to SMEs are a key element of innovation support systems (Cooke et al 2002). This is related to a number of characteristics of SMEs. Firstly, their resource base is limited and hence, is their ability to access new technologies to support their innovative activities, either internally or through external relationships (Lambert 2003). Secondly, the limited human resource of SMEs also constraints, their absorptive capacity and the accompanying gatekeeping and technology adaptation roles (Cohen and Levinthal 1990). Government-sponsored technology mediation organizations can assist in bridging this gap by, for example, providing SMEs with access to applied technology solutions that are tailored to the needs of the business, the resources available, and the capabilities of the employees and managers.

Notwithstanding the recognized importance of technology mediation programs in supporting the innovation needs of SMEs, authors have raised a number of contingencies and reservation regarding the value of these programs. For example, unless the distinction between expressed needs of SME owners/managers and latent needs is grasped and designed into support interventions, there is a significant risk that support programs may in fact be misaligned (North, Smallbone and Vickers 2001). Hassink (1997, 1996) has pointed to the importance of support systems that foster ongoing relationships between technology mediation organizations and SMEs, rather than once-off piecemeal interventions. The latter approach is far less likely to contribute to the development of sustainable cultures of improvement. Holbrook (2002), Thomas (2000) and Morgan and Nauwelaers (1999) further identify the risk that government-sponsored innovation support programs may not be linked to a broader strategic policy intent, such as regional or national priorities for innovation support and, hence, do not lead to systemic improvement. Finally, North, Smallbone and Vickers (2001) point to SME characteristics such as the individual traits of the manager, distinctive

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organisational cultures and ability to influence the external environment as shaping the influence and impact of technology mediation programs.

The literature is equivocal regarding the role and impact of government-sponsored technology mediation programs. Thus, Todtling and Kaufmann's (2002) study of SME innovation support mechanisms in Upper Austria found that, while the level of satisfaction of surveyed SMEs with such programs was relatively strong, the penetration of these programs was limited. This was due, in part, to the perceived need, accessibility and cost/price. The present study aims to contribute to a better understanding of the role and impact of government innovation support programs for SMEs, as well as exploring the relationship between accessibility and pricing of interventions. The study involves a reasonably in-depth examination of a limited number of SMEs that have participated in a government-sponsored technology assistance program; although the purposeful sample selected represented almost 30% of all users of this program. Hence, the study does not lead to generalisable positions on the importance of government programs of innovation support, but rather adds further insights into some of the nuances that shape the effectiveness of such programs, and not least, the relevance of pricing.

THE STUDY

The Technology Access Program (the TAP Program) is a government-sponsored technology mediation initiative that provides selected small and medium-sized firms (SMEs) with access to consultancy advice relating to specific technology interventions that support the innovative activities of these firms in regard to system, process, organization design or product improvement. The TAP is administered by a government agency responsible for industry development and is delivered by a manufacturing industry consultancy and R&D company. The key objective of the Program is to support SME development by providing access to a specific technology, through a consultancy project. Projects are costed for a maximum of 40 hours, and the cost of each project is subsidized by the government to the value of up to 75%. Examples of projects delivered through the Program include research and development, tax break diagnosis, funding application support, layout planning and feasibility assessment of new equipment, notably, robotics. Assistance is not provided for projects that focus essentially on administration, marketing, finance or general management.

Assistance is provided for new initiatives being considered by SMEs, that have the capability to benefit directly from this type of assistance. Any company other than a micro business may be eligible for assistance and hence, access to the Program is essentially limited only by the provider's capabilities, firm capabilities, and the program budget. The program is intended to benefit manufacturing firms in metropolitan and regional centres, and the provider aims to provide at least fifty per cent of products to firms in regional centres.

The delivery of a product, typically, involves an initial meeting to explore the needs of the company, eligibility against program criteria and the provider's capability to meet that need and the cost. Once the agreement is reached in regard to a specific product and price, the consultancy project begins. This usually involves one or more site visits, inspections and data gathering. A report is then produced by the consultant and this is delivered to the client, with appropriate explanation and debriefing. The report would contain a number of recommendations for action and it is the client's responsibility to proceed with implementation. Although the consultant may provide ad hoc advice during implementation, further detailed assistance would usually require the creation of a new project, either through the TAP or through a separate contract for services. Companies are required to complete an evaluation of the product within 30 days of completion, and payment of the subsidy is contingent on completion of this task.

The study covered a sample of products delivered over an eighteen month period. Fifteen companies were selected for review. This represented approximately 27% of the total number of companies that had used the technology access program. Selection of the companies was by purposeful sampling based on the following criteria: location (metropolitan and regional firms); manufacturing sub-sector; type of product delivered; time elapsed since completion and outcomes. The latter was intended to identify a mix of firms where outcomes were regarded as highly successful and less successful. This was based in part on feedback from consultants and also on feedback received from companies on the products provided in the project evaluations. In addition to the interviews, selected data items from the project evaluations of all 55 technology assistance projects were summarized and analyzed, to provide context for the more detailed work and, where possible, to validate data gathered in the interviews. The interviews with company representatives were conducted using a questionnaire comprising of a number of structured and semi

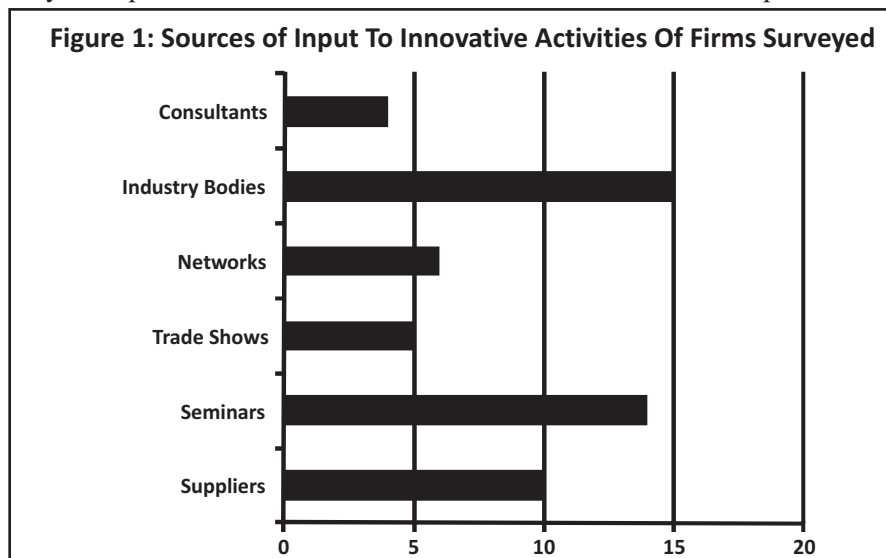
structured questions. The questions were divided into seven sections: company profile; use of the technology access program; satisfaction with product content and product delivery processes; perceived value for money and outcomes achieved. The substantive questions followed a similar order, commencing with a general question about client satisfaction and then proceeding to more specific questions that were aimed at exploring the nature of the overall response. This was a useful approach to eliciting information, although responses were not always confined to the specific question asked and, in some cases, interviewees answered multiple questions in a single answer. The Table 1: summarizes the characteristics of the fifteen companies selected for study.

	Value Stream Mapping	Automation	Factory Layout	Mfng. Audit	ERP	R&D Diagnostics	Robotics	Total
Metropolitan			2	2	2	3		9
Non Metropolitan	2	1	1	1			1	6
Manufacturing sub-sector								0
- Marine				1				1
- Food Process			1					1
- Machine/Equip.	1		1	1		1		4
- Furniture	1			1	2			4
- Fabrication		1						1
- Other			1			2	1	4

In the interviews conducted with company representatives, it was identified that all the companies were on a growth path and had been so for between 12 months and 2 years. Most of the companies had limited external assistance in the past, and their experience with this Program was the first time that they had opened their operations to critical scrutiny. The responses of interviewees regarding the Program were overwhelmingly positive, and most interviewees indicated that they would seek out further opportunities to do business with the service provider and/or with the government agency. These responses were consistent with the data obtained through the Project Evaluations. A review of the Evaluation Forms revealed a consistent superior assessment of the relevance and practicality of interventions, as well as the capability of consultants and the consultancy process. Comments from companies also indicated some degree of ongoing benefit gained from the Program, although this was not always clear.

RESULTS AND DISCUSSION

The results of the study are reported in this section. The results cover the sources of input to the innovative activities of

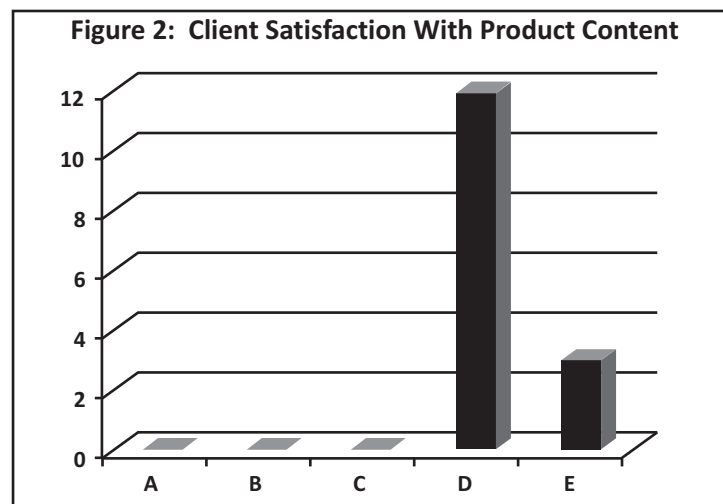


firms; the satisfaction of clients with product content; the outcomes achieved from the technology interventions, perceived value for money of the technology intervention, the pricing of technology assistance products and the purpose of the Program.

❖ **Sources Of Input To Innovation:** Interviewees were asked to comment on their use of external inputs to innovative activities, such as networks, seminars, courses, trade shows, suppliers and consultants. This question set the context of the study, by providing an insight into the positioning of the technology access initiative amongst other external sources of input to innovation.

Figure 1 indicates that firms do maintain external relationships as sources of input to their innovative activities; particularly, through industry bodies, government seminars and suppliers. But the predominant source of innovative activity remained in house experimentation, and response to perceived need. A pertinent point to be made here is that interviewees did not appear to grasp a wider context of the technology access program, but rather seemed to see it as an opportunity to obtain a low cost service from the government. This is not unreasonable, but it does beg the question of whether the policy intent of the Program is communicated clearly. There is room for a more systemic approach to assistance that includes some emphasis on linking interested firms to wider networks (as well as introducing firms to other products supplied by QMIS and others that may be helpful in fostering a culture of innovation). This is particularly important in non-metropolitan areas, where the opportunities for industry networking are more limited.

❖ **Product Content:** Participants were invited to indicate their satisfaction with the content of the product delivered by the QMIS Consultant (on a scale of 1 to 5; 5 being high), and to comment on aspects of the product that they valued highly and areas for improvement. The results for the overall indicator of satisfaction are shown in Figure 2.



In Figure 2, A to E correspond to the scale of responses, from low to high. The number of companies responding at each level is indicated on the y axis. Figure 2 shows that the level of satisfaction of surveyed companies with the quality of the product delivered by the consultants was high. Although, not all companies indicated satisfaction at the highest level, this was often because interviewees believed that there was always room for improvement, rather than being indicative of a specific shortcoming. In broad terms, the most valued aspects of product content included:

- ❖ Confirmed managers' thinking about areas for improvement and made practical suggestions for improvement, as well as identifying realistic constraints (10);
- ❖ Serious gains in productivity and innovation (9);
- ❖ Extended current thinking (2);
- ❖ Independent assessment of the problem (2).

Note that multiple responses were made by some interviewees.

Many interviewees were not able to point to areas for improvement in product content (notwithstanding that, overall satisfaction was marked down slightly because “*there is always room for improvement*”). However, managers in four of the firms surveyed pointed to the following areas for improvement in product content:

- ❖ Providing access to 'demonstration' sites early in the consultancy, (where appropriate) so that the manager could

“see what success looked like”. This applied particularly to process and layout improvement projects.

❁ Providing access to a broader suite of suppliers of recommended solutions. One manager reported that the recommendations tended to focus overly on the service provider's own products, rather than suggesting a wider range of suppliers. However, this manager was not aware of other potential suppliers of the products recommended.

❁ **Outcomes:** The survey pointed to a degree of systemic improvement in firms as a result of the technologies to which they were introduced through the Program. All firms pointed to one or more processes, systems, organizations, or product changes that had resulted from their involvement in the Program. In some cases, interviewees were able to quantify the impact of the improvement, for example, a 20% increase in productivity. But, in most cases, interviewees chose to express the impacts of TAP projects in broader terms. Only two of the fifteen firms indicated that they were proposing to enhance the benefits of the TAP project through ongoing collaboration with suppliers and customers. This is not a conclusive result, but is certainly indicative of a need to reflect on the purpose of the TAP. The extent of these outcomes is shown in Figure 3.

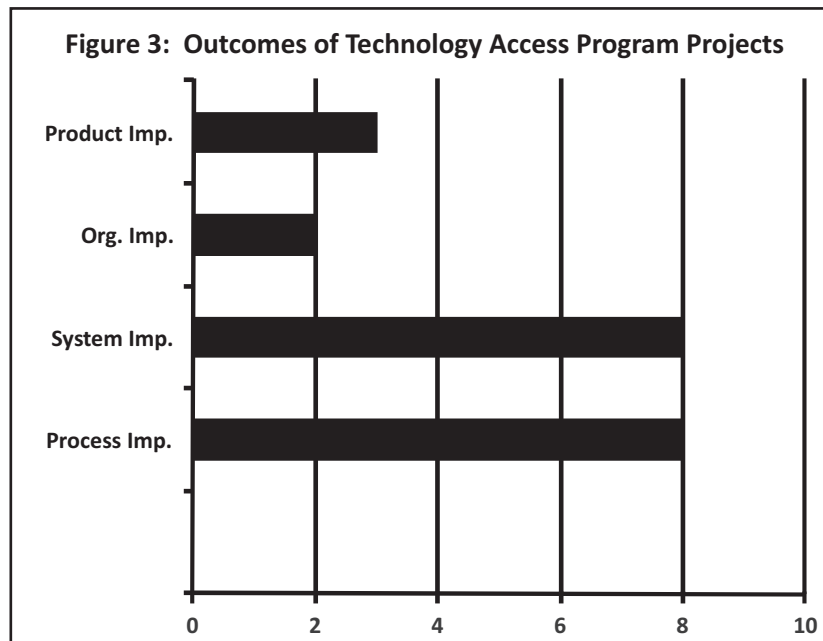


Figure 3 shows that firms achieved multiple outcomes from their projects, with process and systems improvements being the dominant types of change. This is consistent with the intent of the Program, which is to introduce firms to technologies that improve their productivity, quality and performance. In reflecting on the achievement of these improvements, interviewees reported consistently, the input from the Program as being the catalyst. In some cases, the intervention clarified and operationalized ideas and formative steps that had begun already in the firm. It is noteworthy here that project outputs were specific and focused on one or more areas of improvement and hence, barring unforeseen delays or a change of heart by the firm, it is almost assured that the successful implementation of a particular intervention will yield clear improvements. This may explain why interviewees could not point to any obstacles to implementation of recommendations or to the realization of project deliverables beyond matters of time, cost and space. Nonetheless, the structure of product delivery may benefit from closer attention to specification of outcomes and, where practicable, quantification of possible direct benefits to the firms. This would assist in a number of ways. First, it would lead firms to engage more fully with the possibilities arising from the technology interventions and their impacts. Secondly, it would assist in developing a stronger packaged approach to solution building and delivery; and thirdly, potentially, this would aid in pricing. The latter is discussed below.

❁ **Value For Money :** Participants were asked to rate their perceptions of value for money from the technology assistance projects. Figure 4 summarizes client perceptions of value for money from projects in which they participated.

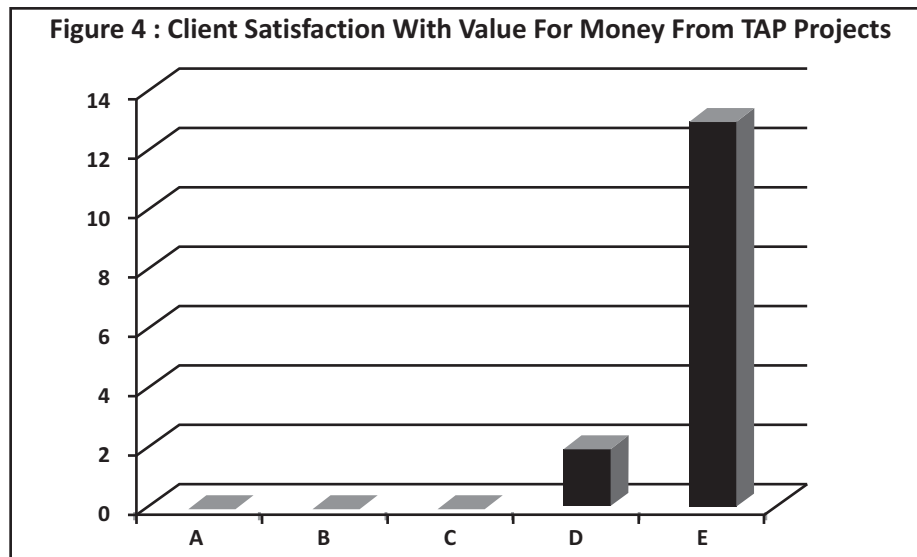


Figure 4 shows that interviewees, on the whole, were highly satisfied with the value for money of the TAP projects. Only 2 of the fifteen participants rated their satisfaction with this element to be less than superlative. The most valued aspects from a value for money perspective reported were:

- ✿ Productivity improvement (11);
- ✿ Provided a reality check (6);
- ✿ Confirmed internal firm thinking/direction (9);
- ✿ Introduction to what was possible (3);
- ✿ Change of culture (2);
- ✿ Knowledge of consultant transferred (2);
- ✿ Specific recommendations that could be put to work (3);
- ✿ Return on investment (3).

None of the interviewees made suggestions of areas where value for money could be improved. There was a demonstrably strong belief amongst participants that projects represented sound value for money. A key element in this belief was that the product cost was generous, as compared to the perceived benefits. As a follow-up to the structured questions on this aspect of the Program, interviewees were asked about their perception of value for money from a cost/benefit position. Without exception, interviewees indicated that the returns on their relatively modest investments were high and the risks (at least in terms of the projects deliverables), were quite low. The issue here is that the strong positive value for money result was attributable, in part, to the relatively low cost of the projects, relative to the quality of the products delivered. This leads to further consideration of the pricing of the projects. The parameters of this technology access program are broad, and demand, potentially outstrips supply. The entry requirements are relatively low. Although, there were no formal guidelines in place, discussion with consultants involved in product delivery indicated that the objectives of the Program related to project outputs (that is, delivering a specific intervention that will yield benefits to a firm) and the only real limits to the provision of products are location, firm capability, provider capability, and budget. The subsidy accentuates this position because it makes the Program attractive to a much broader range of firms. There appears to be a gap in the unique, strategic purpose driving the Program. There are objectives in terms of the delivery of products that are expected to have some reasonably proximate benefits to the firms. However, this does not appear to be linked to a deeper view of systemic business/industry improvement.

If a clearer, strategic purpose was in place, access to the Program may well require different criteria that distinguishes this initiative from other sources of business improvement advice. For example, if the purpose of the program included fostering a culture of innovation/improvement in firms, then it is doubtful that ad hoc injections of technological input, as currently provided, would be effective. Yet, an essentially ad hoc approach is all that is possible under the current regime, because the current design creates a very wide net within a limited allocation of

funding. The effect of this is that interventions are, of necessity, ad hoc and not targeted in a strategic manner within a larger purpose relating to manufacturing industries. The level of continuing business with the consulting firm that delivers the products is limited. There are a number of possible explanations for this; but one reason is that the Program interventions are seen as ad hoc pieces of assistance by the firms involved, many of which have had no previous experience with technology assistance, and may not do so in the future. It was certainly evident that many of the senior managers interviewed did not see the projects as part of a broader context for continuing improvement and innovation.

A Program purpose, such as fostering cultures of innovation and improvement in firms may require a much more packaged approach with multiple interventions over time that involve partnerships with external organizations. This would almost certainly have implications for pricing and for funding. But, in the absence of such an approach, the risk is that once off interventions may not lead to sustainable improvements in business or industry and, consequently, may not be delivering the quality of outcome expected by the government. A further risk is that, as demand increases, the basis upon which choices are made to grant access to the Program becomes increasingly arbitrary or guided by informal selection criteria that are not transparent.

❖ **Pricing Of Projects:** A key issue that emerges from this study relates to the pricing of the technology access projects. The current position is that companies accepted into the Program are offering a subsidy of 75% of the total project costs. The average cost to clients of their projects covered in this Review was between \$2000 and \$2500. This is modest, compared to the actual and potential benefits delivered by the projects. As indicated above, all of the firms surveyed had been established for several years and all reported that they were on a growth path and had been so for at least 2 years. Figure 5 shows the distribution of the age of firms.

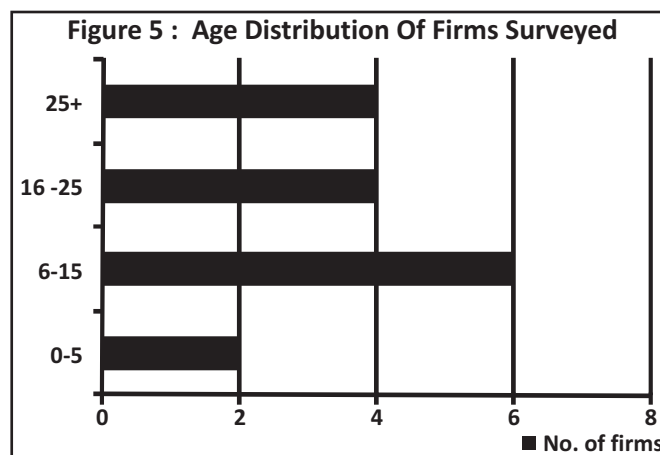


Figure 5 shows that most firms surveyed had been established for over 6 years, with half of all firms being in operation for over 16 years. For these companies, the prospect of obtaining access to specific, superior quality advice on innovation at a low cost is highly attractive. There is a case to be made for aligning more effectively, the cost/benefit position of the projects. A number of options are possible in this regard. The first option would be to reduce subsidy for all entrants. This option would have an immediate impact in rebalancing cost/benefit, but has a significant downside in potentially disadvantaging non-metropolitan firms who may not ordinarily have access to the kind of service provided by the Program. This could be addressed by having two levels of subsidy - one for metropolitan firms and the other for non-metropolitan firms.

A second option would be to apply the subsidy on a sliding scale based on a number of threshold tests. This option would be to address pricing on a case by case basis, according to economic need and equity. Possible threshold tests might include some or all of the following factors:

- ❖ Capacity to pay (for example, based on turnover);
- ❖ Estimated level of direct benefit from project;
- ❖ Access/location;
- ❖ Previous use of the Program;

- ⊗ Previous use of similar services;
- ⊗ Packaging of services (the greater the number of services accessed, the higher the subsidy), and
- ⊗ Complexity of the technology.

Although the use of threshold tests in pricing products delivered under the Program would provide some degree of equity, there would still remain a certain level of discretion in charging. Whether this is reasonable or not will depend, in significant part, on the purpose of the Program. This is discussed further below.

A third option is not directly concerned with pricing, but operates as a de facto price mechanism and involves tightening the entry criteria into the Program. At present, the barriers to entry are low. In essence, any locally-based business that is not a micro-business is eligible to participate. There is no discrimination based on a need or potential impact (other than that the technology can and will be actually used). It would be possible to introduce tighter entry criteria and align these with pricing. Thus, for example, the Program might be skewed towards firms in the early stages of operation, with a sound management team and approach and potential to capitalize the knowledge arising from the projects quickly. Other firms that do not meet these criteria would be charged full price. The limitation of this approach is that, unless the criteria are selected carefully, the market for the Program may shrink; or, deserving firms may be denied access.

The framing of pricing options and the choice of option turn on the purpose of the technology access program. At one level, it may be argued that it is intended to give qualifying firms a helping hand by introducing them to a specific technology option. This, however, is a broad test that has limited merit in selecting the pricing policy. The natural consequence of this broad test is that the funding of this Program should increase to meet demand. The alternative is that, as demand increases, arbitrary choices are made or de facto eligibility rules are created to spread the funding pool as effectively as practicable. To allocate \$X to Y firms is satisfactory, while the level of eligible and interested firms is modest. However, if demand increases, there is no clear, transparent basis for making choices about which firms are offered a technology project, and which firms are not.

A firmer basis for pricing and product design and delivery would be to consider the outcomes desired of the Program, as indicated earlier, and aligning the pricing accordingly. For example, it may be stated that the purpose is to foster a culture of improvement in manufacturing and immediate capitalization of knowledge. If that were so, then an appropriate pricing policy would take account the potential benefit and also packaging of additional and ongoing solutions. On the other hand, if the purpose of the Program was largely to help firms that might be considered as outliers to ramp up their performance, then a heavier subsidy would be justified, and pricing would be adjusted accordingly.

CONCLUSIONS

The study explored the use of a government-sponsored technology access program, that is intended to be a catalyst for the innovate activities of SMEs in the manufacturing sector in an Australian State. Specifically, the study aimed to establish the relevance of the technology interventions available through this Program for SMEs, as measured by the outcomes achieved and the perceived value for money. The relationship between the purpose of the Program, satisfaction with outcomes and pricing was also examined.

The study makes a number of key points. First, government-sponsored technology mediation programs play an important role as external catalysts for the innovative activities of SMEs. The technology access program was regarded highly by participants in relation to both, product content and value for money of the outputs. Interviewees spoke highly of the relevance, practicality and productivity benefits of the technology solutions that were made available, and the skills, professionalism and commitment of the consultants who delivered the products. Every senior manager was able to point to innovative activities that resulted from the projects, in system, process, organization or product improvement. In some cases, the benefits were quantified and in others, the improvements were described in more qualitative terms. Across all of the items assessed in this study, managers rated the Program in superlative or close to superlative terms.

Secondly, the pricing of the products delivered under the technology access Program creates a low cost/low risk environment for participating firms, but may not necessarily contribute to the realization of policy objectives. This, in turn, is related to a weakness in the specification of the purpose of the Program.

Product pricing is a contentious issue and needs to be considered sensitively. The study found that the pricing of

products was significantly lower than the value placed by managers on the outputs of projects. Although not quantified, the skew in the existing value proposition was clear. On the one hand, firms had very high regard for the products and the delivery approach. But, in part, this was because the price was low and, consequently, the risks (to the firm) relating to outputs of the projects was also low. Hence, if the project succeeded, there were significant pure profits for the firm; but if it was less than successful, the investment risk was low. This is a desirable position for the firms, but perhaps, less than desirable for the government. Whether it is good for government or not depends on the purpose of the technology access program. If the pricing policy aims to foster take up of technology solutions only, with little reference to potential benefits or savings, then it is likely that funding for the Program will come under greater pressure as demand increases. An alternative view may be that pricing should reflect a range of factors, including equity, capacity to pay and potential benefits. This is a more sophisticated value proposition. In regard to pricing, a number of options are offered, in part, because the pricing policy is interrelated with the purpose of the technology access Program. The technology access Program has been a successful intervention that has led to significant innovative activity in the firms that have participated. Every manager that participated in the study indicated that they would value the opportunity to use the Program again, and to undertake further work with the service provider as opportunity and need allowed.

The Program can be modified to provide a more systemic basis for SME engagement with external sources of innovative impulse. This could be done, for example, by fostering network development as part of product delivery, and also by working with groups of firms on technology interventions that are mutually beneficial. Given the success of the technology access Program to date, further research is warranted on the strategies that may be implemented to establish such programs on a more systemic footing, and the incentive structures that must accompany these. The development of a more sophisticated value proposition for the Program would almost certainly need to be accompanied by a review of the pricing policy that addressed more clearly, the capacity to pay of firms and benefits realization. Again, further work on the measurement of benefits from technology interventions and their appropriation is warranted. Finally, if a more systemic approach is taken to the design and delivery of such Programs, a concomitant requirement would be to measure the impact of interventions over time on firm and industry productivity and performance. This is a substantive field of work in itself, but one that has not been addressed robustly in the evaluation of government-sponsored technology-based services in Australia.

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