

Characteristics Of Innovation In the Services Sector in British Columbia

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INTRODUCTION

There is often a perception that the primary objective of science and technology (S&T) policy is the further development of the manufacturing sector. Policy-makers also need to consider the application of S&T to and the role of technological innovation in the development of service-based industries. These industries have many attractions for both in developed or developing economies - they are often labour-intensive, environmentally sound, and usually consistent with the objectives of sustainable development.

R&D programs are usually carried out as part of a national effort to develop knowledge to produce new products or processes. In the national system of innovation (NSI) of a developed economy, universities and government laboratories produce new knowledge to feed the manufacturing sector. The productive asset is the manufacturing base. In the services sector this is not so: the assets are human assets, and the strength of the sector is dependent upon the ability of the national system of innovation to supply and transfer knowledge embedded in people, rather than in machinery.

Studies of innovation in Canada have been carried out at the national level, but because of the preponderance of industrial activity in Ontario and Quebec, the results understandably reflect the characteristics of these manufacturing based provinces. (See for example Baldwin & Da Pont, 1996; Baldwin *et al*, 1994). There have also been studies of regional industrial clusters (or "poles") and comparisons of regional, or sub-national, innovative performance. A recent review of these concepts, in the Canadian context, has been published by de la Mothe and others in "Local and Regional Systems of Innovation" (de la Mothe and Paquet 1998). These regional clusters are the building blocks of the Canadian national system of innovation. But how does innovation take place outside these areas, and more importantly, in a post-industrial future, how do service-based industries innovate in areas removed from large industrial concentrations. This is the opposite of the analysis of "poles" of innovation: what happens in those vast spaces between the poles?

The Canadian experience may have relevance elsewhere. In comparing case studies of regional systems of innovation in Canada and Europe, Acs *et al*. have noted that there has been a lag in the recognition of the bottom-up dynamics of innovation in Canada compared to what may be observed in Europe. (Acs, de la Mothe et al. 1996) They found:

- The way in which relationships develop between private concerns and both the community and the public actors, and the way in which “enabling agencies” foster collaboration.
- The importance of leadership - what enables the complex inter-institutional and inter-sectoral partnerships to develop and become operational – it appears the ability of communities to shape their future depends more on social than on technological processes (Davis 1991)
- The great fragility of many local systems of innovation because they are “*weakly institutionalized*”

The purpose of this study was to extract what data can be had in the services sector, with a view to looking at innovation outside the manufacturing sector in a region where manufacturing is not a major element of the economy.

SURVEY METHODOLOGY

A short questionnaire for use with BC enterprises was developed by the authors for use in a survey of Lower Mainland area in March, 1997. The overall results have been reported by Holbrook and Hughes. (Holbrook and Hughes 1998) The questionnaire was not intended to cover all aspects of technological innovation identified in the OECD “Oslo Manual” (OECD 1997) but it had to conform to the main points in the OECD standard. To ensure a reasonable response rate, the questionnaire was short (no more than one page, printed on both sides) so that it would be user friendly, take little managerial time to complete, be comprehensible to a small technology-based entrepreneur based in BC, and be faxable to expedite its return.

A similar survey covering the Okanagan region of BC, a non-metropolitan area dependent mainly on agriculture, tourism, and resource extraction, was conducted in July, 1997. For the Okanagan phase of the project, the questionnaire was modified from the version used for the Lower Mainland. Some of the modifications were the result of conclusions drawn from the analysis of the Lower Mainland responses; others were added to provide additional information on knowledge management and highly qualified personnel. The results of the Okanagan survey have been reported by Holbrook, Padmore, Hughes, and Finch. (Holbrook, et al. 1999)

The samples in both surveys were drawn from two industrial sectoral groups, “high technology” and “policy sectors”. Firms were selected in eight industrial sectors from the two groups: high tech (manufactured products, computer services, and technical services) and policy sectors (food products, forest products, electrical products, construction, and transportation).

To be included in the sample, a firm had to employ at least five people, and have been in operation for at least five years. This criteria was applied based on the assumption that smaller, newer firms are still in the process of stabilizing, and are likely to be quite transient.

It is commonly thought that much innovation occurs in this entrepreneurial environment, the so called “bleeding edge”. This survey was primarily interested in the characteristics of

successful innovators. We assumed an average five year product/service cycle, and that firms that had been in business for less than five years had not yet survived one such cycle. Given that the majority of new ventures fail within the first five years, firms that survived the first five years are more likely to be the successful innovators. Of the 58 service sector firms responding to the survey, the majority (86%) employed between 5 and 25 people. Only one responding firm had more than 50 employees.

SURVEY RESULTS

INNOVATIVENESS

A majority of the services firms in the sample believed that they were innovative. 88% (n = 49) of service firms reported having introduced a new product or process in the past five years. However, earlier research indicated that simply introducing a new product was necessary but not sufficient as an indication of innovation – to be innovative a product must also be unique in its market. (Holbrook and Hughes 1998) Applying this measure, the “New&Unique filter,” 60% (n = 30) of firms introducing a new product claimed that their product was unique. Therefore, 52% of the service firms responding to the survey were considered to be innovative.

By industry group, firms providing computer-related services are much more innovative than technical service providers. Three in four (75%) of computer-related service firms reported new and unique products and/or processes, compared with only two in five (39%) technical service firms.

In general, service firms reported the introduction of new products/processes as beneficial. Respondents reported positive effects on profitability (74%), cash flow (57%), market share (63%), competitiveness (85%), productivity (63%) and quality of service (67%). Perhaps surprisingly, most service firms (73%) reported the introduction of new products/services as having no effect on labour relations, with most of the remainder (23% of the total) reporting the effects of innovation on labour relations as positive.

Firms providing computer-related services reported were much more positive in their view of the effects of innovation than technical service providers. With the exception of labour relations noted above, a large majority of computer-related service providers reported positive effects. On the other hand, technical service providers were less enthusiastic. One in five reported negative effects on profitability (18%) and cash flow (21%). Less than half (41%) reported positive effects on cash flow. Although most (77%) reported a positive effect on competitiveness, only half (50%) reported a corresponding positive effect on market share. (Table 1)

Insert : Table 1 - Effects of Innovation

SOURCES OF INNOVATION

For this section of the survey, firms were asked to rate various sources of innovation as not valuable (0), valuable (1), or critical (2). This allowed the construction of a “value index” of sources of innovation based on the mean of responses to each question. Using this value index, service firms ranked customers (1.51), in-house R&D (1.46), management (1.41), sales and marketing (1.24), and production (1.24), as valuable to their innovation processes.(Figure 1) Suppliers, (0.72), out-sourced R&D (0.70), and professional networking (0.60) are all seen as less important sources of innovation.

Insert Figure 1: Sources of Innovation

Computer-related service providers view their competitors as a source of innovation much more than do technical service providers, as well as other industrial sectors (value index = 1.34 for computer-related services, 0.73 for technical services, 0.83 for non service sectors.)

FACTORS AFFECTING INNOVATION

In this section of the survey, respondents were asked to identify various “factors” affecting innovation at their firm as “helping,” “hindering,” or having “no effect.” Results of this section are shown in Table 2.

Insert Table 2 - Factors Affecting Innovation

For service firms, customers (83%), competition (74%), and the risk/reward of innovation (54%) were seen as the main external factors “helping” innovation. Availability of raw materials, and environmental concerns, have (quite understandably) no effect on innovation in service firms.

In comparison to non-service firms, some interesting differences become apparent. Most noticeably, service firms appear to be more concerned about the costs of innovation (36% “helps”, 43% “hinders”) than non-service firms (52% “helps”, 24% “hinders”). Service firms are also more concerned about the availability of financing and personnel than firms in other sectors.

Service firms are less concerned about the risk/reward of innovation than non-service firms. This may be related to the fact that service firms are more likely to view competition as a positive factor affecting innovation. Finally, service firms are slightly less negative in their view of the effects government policies and programs than are non-service firms.

In this section of the survey, there were no significant differences in responses from computer-related services and technical services.

OTHER RESULTS

Investment in capital equipment: Purchases of capital equipment were reported by 98% (all but one) of service firms responding to the survey. Of these, 84% confirmed that this equipment contained significant technological advances. This is somewhat higher than for all respondents, where 91% reported new capital equipment, with 75% of this equipment containing significant technological advances.

Resources for product/process development: Three in four (74%) service firms reported that they had applied some kind of resources to the development of new products/processes. This compares to 71% for all respondents. Of innovative service firms, 93% reported applying resources for development, compared to only 54% of non-innovative service firms.

Use of government incentive programs: One half (50%) of service firms reported having used government incentive programs such as the SR&ED or IRAP programs (these two were specifically listed in the survey), compared to 39% for the all respondents. Three in four (73%) of innovative firms made use of government incentives, while the same proportion (75%) of non-innovating firms did not.

In previous analyses of this data, a comparison was made between the use of government programs and the view of government as a factor affecting innovation. In this analysis, 79% of service firms responding that government “helps” innovation reported having made use of an incentive program. Conversely, however, only 39% of those who had made use of a program viewed government as “helping” innovation.

Human Resources: Service firms reported that training existing personnel was the preferred method for obtaining needed skills - 88% of firms responded this way. This result was consistent for innovative and non-innovative firms. However, while 79% of service firms reported that they would hire a new employee to obtain needed skills, 89% of innovative firms responded that they would hire for skills, compared to 69% of non-innovative firms.

A majority (83%) of service firms reported formal or informal training programs, with an identical distribution for innovative and non-innovative firms. This compared with 80% of all firms reporting training programs.

Service firms are more likely to employ post-secondary graduates. Three in five (60%) service firms, compared (34%) to a third for all respondents, reported that 60% or more of their employees had post-secondary education. This figure increases to 70% for innovative service firms.

Exports: Service firms by nature tend to be regional in focus. A third of service firms (34%) reported 60% or more of total sales outside BC, which is comparable to the overall response. Only 13% of service firms report more than 60% of total sales outside Canada,

compared to 20% of all respondents. However, fully half (50%) of innovative service firms report more than 60% of their sales outside of BC, and 16% report more than 80% of their sales outside Canada.

KEY FINDINGS

The results of this survey can be used to give some indication of the strength (or weakness) of the linkages in the BC system of innovation. Firms in the service sectors are slightly more likely to introduce new products than firms in other sectors: 88% of service sector respondents reported having introduced a new product or process in the last five years, compared to 83% of firms in other sectors. However, service sector firms are no more innovative than firms in other sectors. By the New&Unique filter, 52% of service sector firms are innovative, exactly the same proportion as for all respondents to this survey.

For respondents to this survey, it appears that service sector firms see competition as more important to their business environment than do other sectors. Several observations support this conclusion:

1. Service sector firms were less positive than other respondents about the benefits of innovation, with two exceptions: competitiveness, and quality of service. Service sector firms appeared more inclined to let their financial position (profitability and cash flow) suffer in order to stay ahead of competitors. Correspondingly, service sector firms did not report negative impacts of innovation on market share.
2. Innovative service sector firms rely more on competitors as a source of innovation than do other respondents. They also place much higher value on customers, and slightly higher value on professional networks, as sources of innovation than do firms in other sectors.
3. Service sector firms are significantly more likely to regard competition as a factor "helping" innovation than do firms in other sectors. At the same time, they are more likely to regard development costs as a factor hindering innovation. Outside of this increased concern for and awareness of competition, the service firms in BC that responded to our survey are not significantly different from firms in other sectors.

IMPLICATIONS FOR OTHER ECONOMIES

This type of survey raises many more questions than it answers. While a developing economy may have a small manufacturing sector, or may have only a raw agricultural resources sector, perhaps with little or no mining and forestry industries, the services sector is an important element of any economy. The services sector is an important area for policymakers, including S&T policy makers, yet relatively little is known about the sector, including the influence of S&T on the productivity of the sector and the social impacts of S&T in the services sector. The Oslo Manual makes relatively few references to the services sector, even though a service is as much a product as any tangible good.

In many economies the public sector is a major provider of both goods and services. At

a recent workshop in the Caribbean sponsored by the OAS and RICYT, the participants drew up a table to demonstrate the need to understand the impacts of S&T on the public sector, in the same way that the private sector is surveyed and analyzed. This table is reproduced (with some editing) below:

	Public Sector	Private sector (including state-owned corporations)
Technology-dependent products	water	agriculture forestry mining/petroleum primary manufacturing
Technology-dependent services	education post office libraries primary health care civil works	financial services tourism waste disposal
Technology-intensive products		high-tech products
Technology-intensive services	agricultural and industrial extension services airports hospitals	telecommunications informatics engineering services electrical power

As an example, in many developing countries tourism and tourist-related activities are an important element of the service economy. In the case of BC, as well as conventional tourist-based activities based on the natural environment, many advanced agri-foods businesses include tourist activities in their business activities. The researchers were asked by regional economic development authorities to apply their survey to the tourist sector, and determine to what extent to the tourism sector was an innovative sector. Initial results suggest that tourism enterprises can be, and are, innovative, just as the other firms in non high-tech sectors. However much further work remains to be done to connect tourism services responses to responses from other services industries.

Under these circumstances, it is not unreasonable to suggest that RICYT should consider a project to prepare a version of the Oslo Manual, suitable for use by RICYT members, which would contain examples and advice for carrying out innovation

surveys in the services sector. This revised version should consider both innovation that might occur in the public sector, and innovation in both the public and private components of the services sector.

Another area requiring improvement is knowledge on the levels transfers from studies to employment. Given the high cost of post-secondary education, more knowledge is needed as to about how the resulting talents are used, and how, over time, technical knowledge is either augmented or depreciated. Studies of the stocks and flows of human capital lead directly to the study of the actors and networks that make up an NSI. This is a field which is only just beginning to be being examined, but which is probably important in smaller economies than in larger ones, where the sheer number of networks and individual actors, results in individual actor-networks having less individual influence on the system.

CONCLUSIONS

Some messages for policy makers interested in the development of service industries in the emerging knowledge-based economy can be derived from the data. Small service industries appear to behave similarly to their counterparts in the manufacturing sector. More importantly, like the manufacturing sector, they regard human factors, as they affect innovation, to be more significant than other factors.

With the current emphasis on job creation as a policy goal in itself, the analysis of non high-tech sectors becomes more important. Natural resource based industries and consumer service based industries (such as tourism) can all be innovative within their markets. In BC these services industries tend to cluster, by sector, so that it is important to be able to situate them in any policy framework devoted to enhancing the innovativeness of firms as a whole. The link between the tourism sector and other (innovative) sectors such as agrifoods, is also important, at least in the BC context.

While the limited data from the survey can only provide a glimpse of the policy issues emerging from the analysis of regional results within BC, the effects of geographical separation do appear to influence the responses. More detailed analysis of the data might suggest specific policy initiatives and improvements; more survey work would provide more precise results. The simple fact that government programs appear to be more negatively regarded in the hinterland suggests an immediate need to improve existing program delivery and a need to develop new programs specifically designed to benefit firms that do not have adequate access to the complex knowledge-based economic infrastructure available in metropolitan areas.

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REFERENCES

- Acs, Z., J. de la Mothe, et al. (1996). "Local Systems of Innovation: In search of an enabling strategy." in *The Implications of Knowledge -Based Growth for Micro-economic Policies*. ed. P. Howett. Calgary, University of Calgary Press: 339 - 360.
- Baldwin, J., & Da Pont, M. (1996). "Innovation in Canadian Manufacturing Enterprises." Ottawa: Statistics Canada.
- Baldwin, J., Gellatly, G., Johnson, J., & Peters, V. (1999). "Innovation in Dynamic Service Industries." Ottawa: Statistics Canada.
- Baldwin, J., & Gellatly, G. (1998) "Are There High Tech Industries or Only High Tech Firms? Evidence from New Technology-based Firms." Ottawa: Statistics Canada
- Baldwin, J. R., Chandler, W., Le, C., & Papailiadis, T. (1994). "Strategies for Success." Ottawa: Statistics Canada.
- BCStats. (1997). "The British Columbia High Technology Sector ". Victoria: BC Stats; Ministry of Finance and Corporate Relations.
- Davis, C. (1991). *Local Initiatives to Promote Technological Innovation in Canada: Eight Case Studies*. Ottawa, Science Council of Canada.
- de la Mothe, J. and G. Paquet, (eds) (1998). *Local and Regional Systems of Innovation*. Boston, Kluwer Academic Press.
- Holbrook, J. A. D. and L. P. Hughes (1998). "Innovation in Enterprises in British Columbia." in J. de La Mothe and G. Paquet (eds) *Local and Regional Systems of Innovation*. Boston, Kluwer Academic Press.
- Holbrook, J. A. D., Padmore, T., L. P. Hughes, & J. A. Finch (1999). "Characteristics of innovation in a non-metropolitan area: the Okanagan Valley of British Columbia." Innovation Systems Research Network, 1st Conference, Toronto, 1999
- Hughes, L. P. and J. A. D. Holbrook (1998). "Measuring knowledge management: a new indicator for innovation in enterprises." Vancouver, Centre for Policy Research on Science and Technology, Simon Fraser University.

OECD (1997). *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (The Oslo Manual), 2nd Edition*. Paris, Organization for Economic Co-operation and Development.