

Characteristics Of Innovation In A Non-Metropolitan Area: The Okanagan Valley Of British Columbia

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Introduction

Governments in most jurisdictions support, in one way or another, S&T programs in the firm belief that investments in S&T have a positive, if indefinable, effect on economic growth. Recently the development of the “new growth theory” of economics has provided the theoretical basis linking investment in S&T to economic growth. As Paul Romer¹ has pointed out:

...there's another process underlying the business cycle - the process of discovery and invention. It is this process that generates long-run improvements in the standard of living. If you want to think of it as a picture, you can see economic growth as a long-run upward trend line, (with) the business cycle as little wiggles around that line. What determines how high we climb in the long run is the slope of that line, not the little wiggles.

¹ Paul Romer, quoted in Forbes ASAP, 5 June 1995

The first theoretical constructs of the benefits of S&T knowledge focused on the “linear” model of innovation where an investment in R&D would eventually lead to wealth creation or a social benefit. There were intervening steps where the technologies resulting from R&D were developed and commercialized, but the model suggested that resources expended on R&D would inevitably result in some good at the end of the chain, and that incremental resources would result in incremental benefits.

Current theories take a much wider view of the innovative process, and recognize that R&D is only one of several inputs to wealth generation and social. In a developing economy, the actual level of R&D activities may be quite low, but the level of investment in related science activities may be substantial. The United Nations Educational, Scientific and Cultural Organization (UNESCO), in its definition of S&T includes not only R&D but also national investments in S&T support services (such as libraries and statistical agencies) as well as investments in scientific and technical education.

Similarly statistics on industrial investment on R&D miss those innovative industries are not R&D intensive Firms profit from the larger pool of external knowledge by absorbing and adopting some of it to their own needs; the source can be a competitor, another industry, government, universities or another country. Just as it is important to measure physical capital stocks, it is important to measure and follow the stocks of knowledge and technological capital.

These issues were addressed by the Organization for Economic Cooperation and Development (OECD), in a recent report (OECD, 1996), which concluded that investments in technology embedded in capital equipment, whether imported or produced domestically were equally important as investments in R&D and should be included in assessments of the knowledge intensity of nations. In addition, the authors noted that measuring these investments in technology (as opposed to investments in domestic R&D programs) was particularly important in small industrialized nations and in developing nations.

The Policy Implications of Analyses of National Systems of Innovation

It is convenient, when analysing the stocks and flows of knowledge in an economy, to describe the process of innovation in an economy as a system. Chris Freeman has noted:

The rate of technological change in any country and the effectiveness of companies in world competition in international trade in goods and services, does not depend simply on the scale of their R&D..... It depends on the way in which the available resources are managed and organized, both at the enterprise and national level. The national system of innovation may enable a country with limited resources....to make progress through appropriate combination of imported technology and local adaptation and improvement (Freeman, 1968)

The characteristics of a national system of innovation (NSI) can be summarized as:

- firms are part of a network of public and private sector institutions whose activities and interactions initiate, import, modify and diffuse new technologies
- an NSI consists of linkages (both formal and informal) between institutions
- an NSI includes flows of intellectual resources between institutions
- analysis of NSIs emphasizes learning as a key economic resource and that geography and location still matter

The emphasis on institutions is the cornerstone of NSI analysis. Charles Edquist, in the introduction to his recent book on innovation analyses the literature on NSI, and notes that all of the NSI approaches emphasize the role of institutions:

Institutions are of crucial importance for the innovative process.....It is therefore a great strength of the systems of innovation approach that 'institutions' are central in all versions of it. (Edquist, 1995)

Thus, in analysing NSIs, it is necessary to be able to measure the stocks and flows of knowledge among institutions, both public and private, and if necessary to develop indicators appropriate to this task. Innovation does not necessarily occur only in the private sector, but there is, as yet, no agreement on procedures for the assessment and quantification of innovation in the public sector.

The OECD (1997) has concluded that the study of NSI offers new rationales for government technology policies. Government policies in the past have focussed on market failures; studies of NSI make it possible to study systemic failures. The analysis of NSIs enables policymakers to identify successes and failures, choke points and areas of over-capacity.

The Government of Canada in a recent Speech from the Throne set as a policy objective:

The Government will explore innovative policies and measures that give particular attention to increasing opportunity for Canadians in rural communities. It will adapt its programs to reflect the social and economic realities of rural Canada. Further the Government will redouble its efforts to ensure that rural communities and all regions of Canada share in the economic benefits of the global knowledge-based economy (Government of Canada, 1997)

This statement sets out the need to understand how innovation works in non-metropolitan areas and how government policies can overcome the reduced levels of knowledge-based infrastructure in areas outside large cities. It is the opposite of the analysis of "poles" of innovation: what happens in those vast spaces between the poles? In comparing case studies of regional systems of innovation in Canada and Europe Acs et.al. (1996) 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. 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 interinstitutional and intersectoral partnerships to develop and become operational - it appears the ability of communities to shape their future depends more on social than on technological processes (see Davis, 1991)
- The great fragility of many local systems of innovation because they are "weakly institutionalized"

Current systems of S&T and innovation indicators have been developed primarily by and for large complex national economies. Although smaller economies may not have extensive systems of innovation they too use S&T directly in support of their specific economic and social objectives. In analysing national systems of innovation it may be easier to aggregate upwards from a series of regional systems of innovation to the national level than to try to develop an understanding of a complex national system from the top down.

There have been many 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 presented by de la Mothe and others in “Local and Regional Systems of Innovation”. (de la Mothe, 1998) These local systems of innovation are the building blocks of national systems. The purpose of this study is to go beyond this level of analysis and look at innovation in communities outside the “pole” of innovation in a region.

A Pilot Study on Innovation in Smaller Economies

BC is an ideal laboratory for experiments in the measurement of innovation. The economy is simple, with one large metropolitan area, where most of the innovative firms are located, supported by a hinterland whose primary outputs are in the natural resources sector. BC is a relatively separate economic and geographic region so that external influences in the acquisition and adoption of technology are readily noticeable. Thus (in theory) economic measurements in BC should be relatively well-behaved and predictable.

Within BC, the Okanagan Valley forms a distinct economic sub-region. With a population of about 140,000 centred on the city of Kelowna, the region consists of a long narrow fertile valley surrounded by the Rocky Mountains. Its main economic activities are agricultural (fruit and wine), wood products and tourism. The region is about 400 km. from Vancouver (about one hour by air). According to BC Stats (1996) the region has 307 high-tech based establishments, approximately 6% of the provincial total. Of these, 238 are service based and 69 are manufacturers.

According to survey work carried out by de Wit and Lipsett in 1994, while Okanagan companies were on average as likely to be innovative as other firms in BC (which is of course heavily biased by the concentration of high-tech firms in the Greater Vancouver/Lower Mainland area), they were substantially less likely to have accessed the Scientific Research and Experimental Development (SRED) tax credit program. Only 21% of Okanagan firms had used the program compared to 35% of firms in the two metropolitan areas of BC (Vancouver and Victoria). (de Wit and Lipsett, 1995)

The Centre for Policy Studies on Science and Technology (CPROST) at Simon Fraser University in collaboration with the Centre for Policy Studies in Higher Education and Training at the University of British Columbia has established a major multi-year project to study innovation in smaller economies. Based on the factors listed above, and the encouragement and support of the Central Okanagan Regional Development Commission, it was decided to carry out the first non-metropolitan study in the Okanagan region.

The first element in this study was to carry out a survey of technological innovation in the area. A short questionnaire for use with BC enterprises had been prepared for the project. The results from a survey using this questionnaire in the Lower Mainland area have been reported by 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 had to be 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.

The Okanagan Survey

Questionnaire

For the Okanagan phase of the project, the questionnaire was modified from the version used for the Lower Mainland. The questionnaire is attached as Appendix “A”. 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. For the exact changes please see Appendix “B”.

Sample

As in the Lower Mainland, the sample was drawn from two industrial sectoral groups, “high technology” and “policy sectors”. For the “high-tech” sectors, the sample was drawn from a list of firms provided by the Science Council of British Columbia. This list was compiled in the fall of 1996, and was a comprehensive listing of firms falling into the category of “high technology” as defined by BC Stats. All firms from this list of more than ten employees were included in the sample. The sample for the “policy” sector was drawn from the following sectors: “agricultural products and food processing” (which included wines and spirits), “forest and related products,” and “construction” from the 1997 BC Manufacturer’s Directory database provided by BC Stats. Standard 1990 SICs were used.

Conducting the Survey

The survey of the Okanagan was conducted in June and July 1997. As in the Lower Mainland study, firms were first contacted by telephone, to solicit their participation and to identify the target recipient in the firm, again the CFO. Unless the recipient requested otherwise, the survey package was faxed to the firm, along with two covering letters, one from CPROST and one from the Central Okanagan Regional Development office. Firms from whom no package had been received within two weeks were re-contacted by telephone. These follow-up calls acted as reminders to the respondents, but also gave the researcher an opportunity to get feedback on the actual survey. Respondents’ comments regarding the survey included:

- the questions were good
- the survey was short and they did not mind filling it out
- they had to use their own interpretation on some of the questions
- the survey was “painless” to complete
- a very non-intrusive questionnaire

Findings

Sector	Sample		Response		Rate
	n	%	n	%	
High Technology [1]	48	23.5%	32	28.8%	66.7%
Agrifood	54	26.5%	35	31.5%	64.8%
Forest Products	59	28.9%	30	27.0%	50.8%
Construction	43	21.1%	14	12.6%	32.6%
Total	204	100.0%	111	100.0%	54.4%
Note [1]: High Technology sector used as defined by BC Stats (1997)					

A total of 204 surveys were sent to firms in the Okanagan . Of these, 111 were completed and returned, giving an overall response rate of 54%. Table 1 shows the sectoral breakdown of the responses. Firms ranged in size from 10 to 500 employees, with the majority, 82%, having fewer than 50 employees. The firms also tended to

be regional in focus, with 61% of those responding reporting less than 40% of their sales to be

outside the province.

Innovativeness

A majority of the firms in the Okanagan believed that they were innovative. 86% (n = 95) of firms reported having introduced a new product in the past five years, with 65% (n = 62) of these firms reporting that their product was unique. By the New & Unique filter, therefore, 56% of the firms responding to the survey were innovative.

The differences between high technology firms and those in the Okanagan was much more pronounced than in the Lower Mainland. In the policy sectors, 50% of firms were innovative, while 74% of high tech firms reported that their new products were unique in their market.

Firms that had introduced new products and/or processes (unique or not) reported similar impacts as firms in the Lower Mainland. The new products/processes had positive effects on profitability (87%), cash flow (70%), market share (75%), and competitiveness (85%) Impacts were less clear with respect to productivity (48% no effect, 45% positive), and quality of service (46% no effect, 52% positive), while respondents strongly stated that innovation had no effect on labour relations (81%) Raw results for this section of the survey are shown in Appendix C, Table C.2

Sources of Innovation

Using the value index of innovation described in the Lower Mainland results, Okanagan firms ranked customers (1.73) management (1.45), sales and marketing (1.42), production (1.35), in-house R&D (1.34) as valuable to their innovation processes. (Figure 1, the raw results are shown in Appendix C, Table C.3)

Suppliers were seen as significantly more valuable in the Okanagan (1.13) than in the Lower Mainland (0.90). This is likely a result of the isolation of the Okanagan - for the most part, suppliers are providing technology from outside the region. Another element is that the suppliers are physically located outside the region, usually in the Lower Mainland, so their participation is taken less for granted.

As in the Lower Mainland, out-sourced R&D and production are more important to innovating firms in the policy sectors than in the sample as a whole, indicating process rather than product innovation.

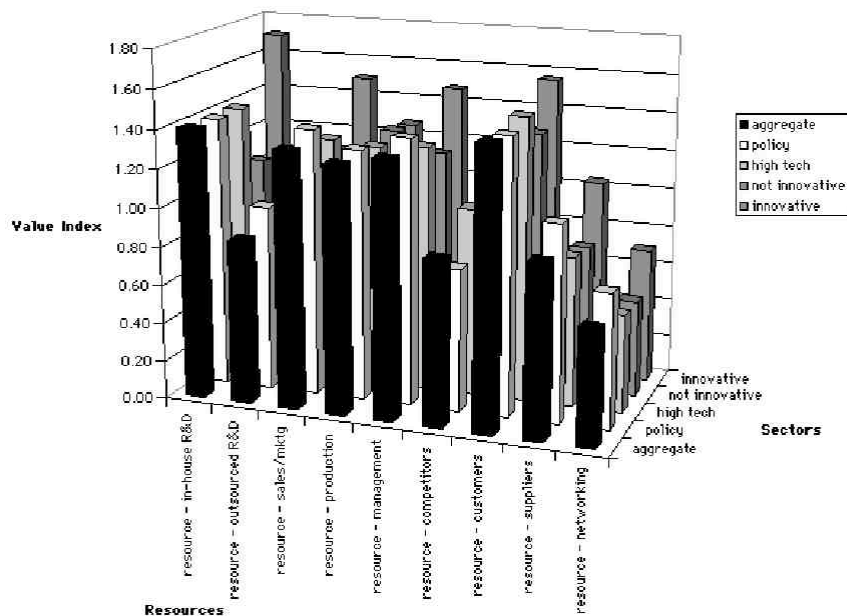


Figure 1: Sources of Innovation, by sector and innovativeness

An interesting finding in the Okanagan is that non-innovating high tech firms place little importance on out-sourced R&D. The number of these firms in the sample is very small (n=8), however five of the firms reported a new product/process in the last five years (but not unique, hence the designation as non-innovating). Are these firms failing to link themselves into the regional system of innovation, and is this the reason for their failure? A possible explanation could be the “not-invented-here” attitude common in engineering firms - an attitude that downplays the importance of outside ideas, tending to rely on internal resources to re-invent technologies and process that can be as easily (or more easily) purchased. This hypothesis is supported by the finding that all of these firms view management attitude and corporate culture as “helping” innovation.

Factors Affecting Innovation

Responses from Okanagan firms to this section agreed quite well with Lower Mainland responses. Firms identified customers (87%), competition (65%), and the risks/rewards of innovation (64%) as the main external factors to “help” innovation in their firms. The aggregate data from this section of the survey is given in Appendix C Table C.4.

Firms in the Okanagan identified government policies (42%), the availability of financing (24%) and the availability of personnel (13%) as the main factors hindering innovation. The case of financing is ambiguous, although it is often a factor hindering innovation, 46% of all firms, and 50% of innovative firms, identified it as a factor helping innovation.

Okanagan firms were much harder on the government than their Lower Mainland counterparts, who were mostly indifferent. Only 14% of firms in the Okanagan responded that government policies “help” innovation, while 43% responded that it had no effect.

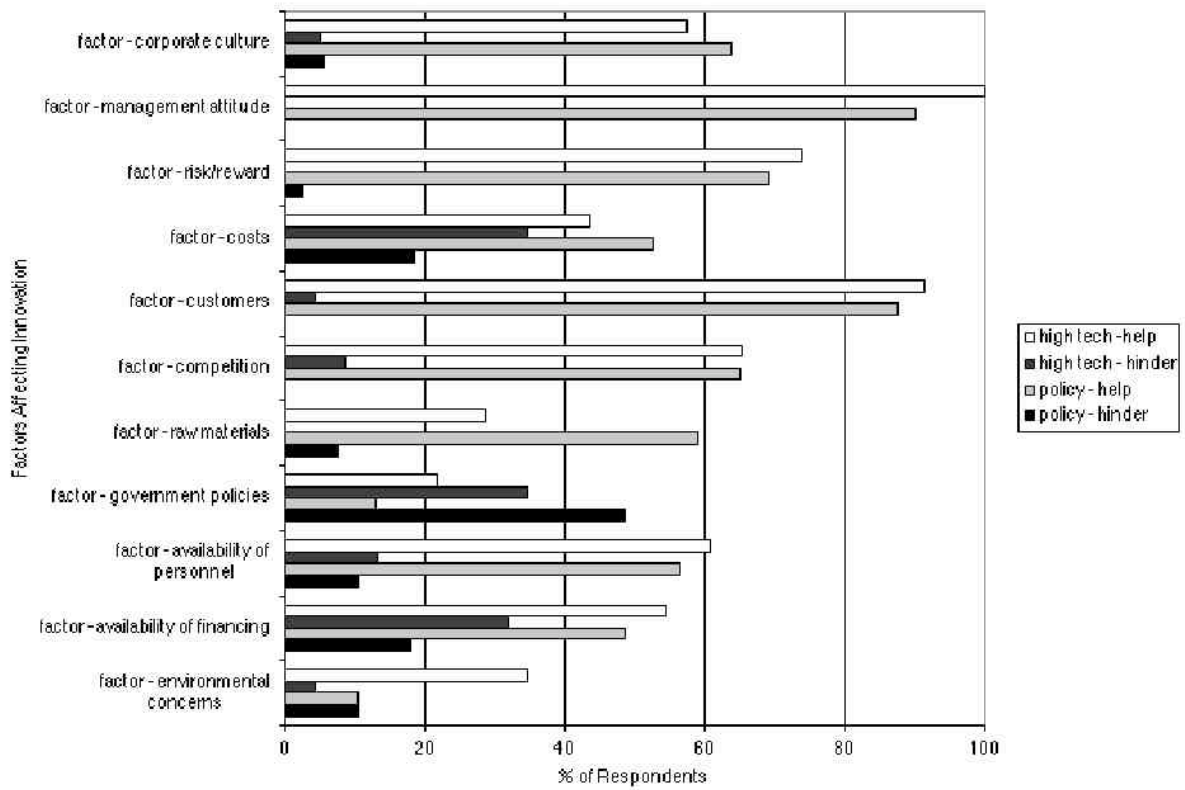


Figure 2a: Factors Affecting Innovation: Innovative firms in the Policy and High Tech Sectors

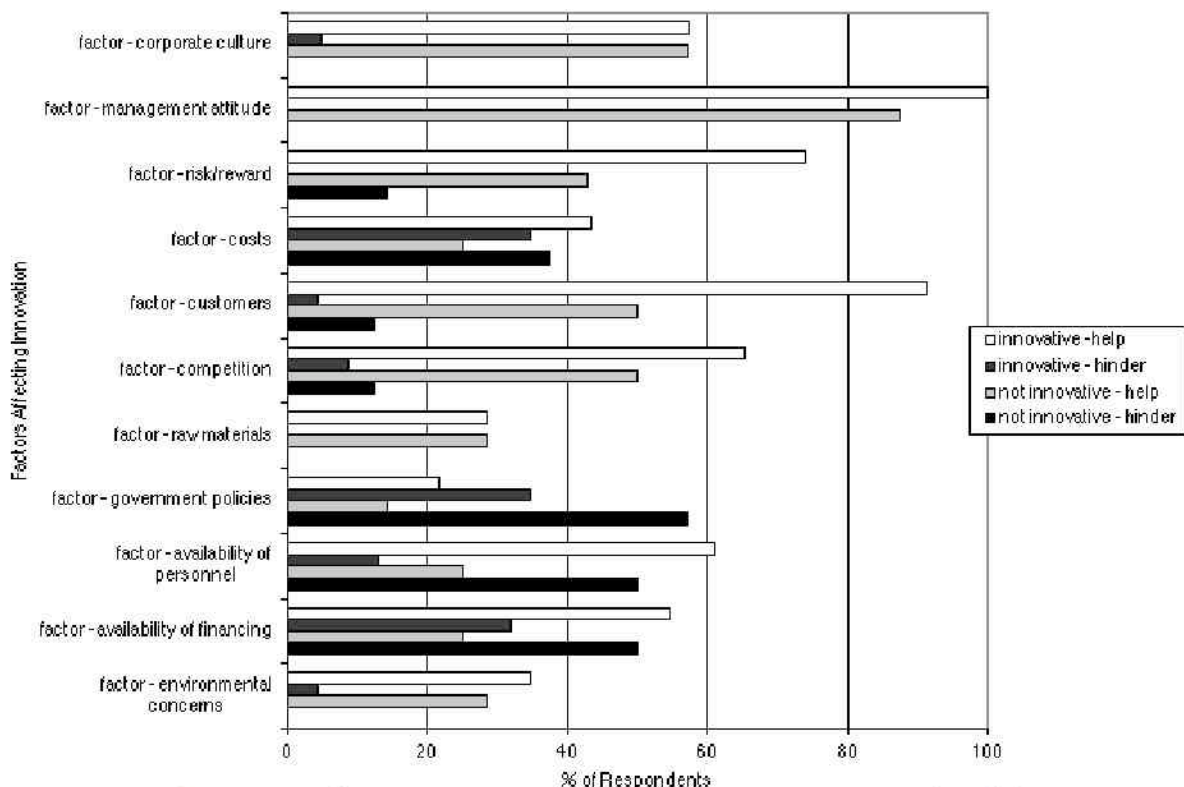


Figure 2a: Factors Affecting Innovation: Innovative and Non-innovative High Tech firms

As in the Lower Mainland, there is more agreement in the responses to this section among innovative firms, regardless of sector, than there is among firms within each sector. However, the converse is not the case. Non-innovative firms in the high tech sectors identify a different set of challenges than do firms in the policy sectors. In particular, high tech non-innovating firms identify development and production costs, government policies, and the availability of financing and personnel as their major obstacles. High tech firms that were innovative, however, only identified government as a major obstacle, although 35% of them did identify cost as hindering their innovative process. Figure 2a gives a comparison of results between innovating firms in policy and high-tech sectors, while 2b compares innovating and non-innovating high tech firms.

Other Findings

Results of the remaining survey questions are shown in Appendix C Table C.5. The findings can be summarized as follows.

Investment in capital equipment: Purchases of capital equipment were reported by 89% of firms in the Okanagan responding to the survey. Of these, 70% confirmed that this equipment contained significant technological advances. These results were reflected by sector, however, 95% of innovative firms reported having purchased new equipment, 80% of these purchases containing significantly new technologies.

Resources for product/process development: Two in three (69%) Okanagan firms reported that they had applied some kind of resources - money, time, and/or effort - to the development of new products/processes. By sector, this breaks down to 60% of respondents from the policy sectors,

and 81% of high tech firms. Of firms classified as innovative, 88% reported applying resources to product/process development; only 42% of firms listed as non-innovative reported the same.

Use of government incentive programs: Only 35% of firms in the Okanagan reported having used government incentive programs such as the SR&ED or IRAP programs (these two were specifically listed in the survey). This broke down to 28% of firms in the policy sectors, and 52% of high tech firms. Only 48% of innovative firms in both sectors reported having used these programs.

An interesting result is obtained by comparing the use of government incentives to the perception of government's effect on innovation. Unlike in the Lower Mainland, there is little difference between those who had and had not used incentive programs in the perception of government as an obstacle to innovation. Firms in the Okanagan, if they care, do not like the government.

Human Resources: Okanagan firms reported that training existing personnel was the preferred method for obtaining needed skills - 89% of firms responded this way. 69% reported that they would hire a new employee to obtain needed skills, while only 45% said they would engage a consultant or contractor. These results were consistent by innovativeness and by sector, however 55% of innovative firms said they would engage a contractor to obtain needed skills.

73% of firms reported formal or informal training programs. Policy sector firms were slightly higher than this average, high tech firms somewhat lower. Innovative firms were more likely to have training programs than non-innovative firms.

Exports: Firms in the Okanagan, both innovative and non-innovative, tend to be regional in focus. A third of innovative firms (34%) reported 60% or more of total sales outside BC, compared to one in five (22%) non-innovative firms. However, only 16% of firms in both segments report more than 60% of total sales outside Canada.

An Overview of the Results

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. 66% of respondents in the Okanagan district reported having introduced a new product or process in the last five years. However there is more to innovation than product or process development. Inherent in the concept of innovation is the idea of uniqueness. For a development to be innovative it must be unique in that firm's competitive market. Thus the questionnaire also asked if the new product or process was unique to the industry. A product or process unique in the industry (to the knowledge of the respondent) would likely be unique in the firm's market thus innovative. By this measure only 56% of respondents were considered innovative.

Firms were asked to rate the value of different sources of technology in the BC system of innovation in terms of contributing to their innovative activities. Figure 1 shows the results, and compares innovative and non-innovative firms. The respondents were also asked to rate factors affecting innovation; these are shown in figure 2. The results from the Okanagan district are shown alongside those of a similar survey of firms in the BC lower mainland (Holbrook and Hughes, 1997)

In terms of sources of innovation, there were few apparent differences between the regions (except "net-works"). Indeed, both regions showed clustering around two specific "actor-

networks”, with in-house R&D units, sales, production management and customers forming a tight network, and out-sourced R&D, competitors and suppliers forming a second tier. Networks formed a significantly higher source of innovative ideas in the Okanagan, possibly reflecting the relative isolation of the region.

Regional differences however played a much more significant role in factors affecting innovation. The Okanagan firms appear to be much more dependent upon the innovative ness of their personnel, with management attitudes and personnel being much more important than in the Lower Mainland. Understandably, lower costs were a factor in the Okanagan, and the stronger response around raw materials probably reflects the stronger agrifood and forest products sectors in the Okanagan economy.

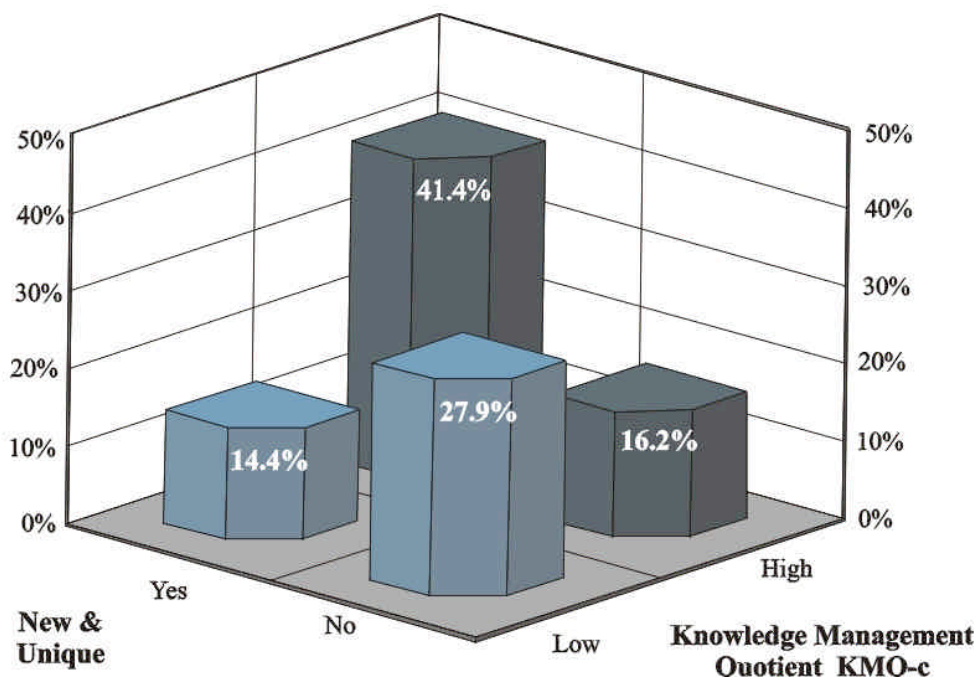


Figure 3: Knowledge Management Quotient

Of interest to governments should be the stronger negative view of the role of government in innovation in the Okanagan. While some of this response may be attributed to the more individualistic nature of entrepreneurs in the area, it probably also reflects the greater distance from government services and a feeling that these services are not assisting innovation in the district.

Included in the analysis was an effort to develop an index of innovativeness, based on responses to questions about firms’ management of technology. Seven questions were used to build up a raw score of innovativeness. As has been reported by Hughes and Holbrook (1998) there was a high correlation between above-average scores from this index and the responses to the question on having developed a product or process that was new to the market which the firm served (figure 3). This “knowledge management index” may provide a short-cut to assessing the innovative potential of a single firm, or group of firms within a specific industrial sector.

A similar index could be developed using human resource related questions from the survey. There was a high response to the question “ (If your company has employee training and education programs). Both high-tech firms and policy sector firms reported having such programs. The significance of the responses to this question will require further analysis.

Anecdotal comments regarding why the Okanagan Valley, and especially the city of Kelowna were perceived as conducive to innovation:

One respondent referred to Kelowna as a “hot bed of activity”. The respondent believes that this is due primarily to the life style the area offers. She referred to it as a “playground”, one that has the amenities of a big city while maintaining a small town atmosphere, with endless outdoor activities. The participant also mentioned Kelowna’s proximity to Vancouver as being one of the benefits of living there. She stressed a key reason why innovative firms were doing business in the area was the lower cost compared to those of Vancouver.

Another respondent suggested there are roughly 50 high-tech service firms in the Kelowna. He felt only those which are entrepreneurial will survive.. He also noted there is a seven year cycle to business endeavours in the area. He felt that high tech firms with creativity and vision will survive and prosper; he felt that Kelowna could represent a microcosmic view of future communities- a self-contained, medium-sized city that offers residents a life-style alternative and the opportunity to run a successful enterprise. He did not feel that a service business such as a restaurant could enjoy the same level of success as a high-tech/knowledge-based enterprise. The primary reason for this is that high-tech firms can enjoy lower costs associated with a smaller community, while doing business on a global scale, for example via Internet. This respondent felt Kelowna could house many more global high-tech businesses.

Tourism

Tourism and tourist-related activities are an important element of the Okanagan economy. As well there being many conventional tourist-based activities based on the surrounding environment, many of the advanced agrifoods businesses include tourist activities in their business activities. The researchers were asked by the 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. The initial results suggest that tourism enterprises can be, and are, innovative, just as the other firms in non high-tech sectors. In compiling the tourism sector data, data from 12 agri-businesses which had tourist facilities (such as vineyards that offered wine tasting and a retail product outlet) were included; they are also included in the main resource/manufacturing/service sample.

Conclusions

The problem is simple: policy makers need information of the state of investment in knowledge and how that investment flows through the NSI. Knowledge is intangible, and is measured only indirectly through money, people and trade in goods and services. While it is possible to measure capital stocks of internally generated new knowledge, using levels of R&D funding as a unit of measurement, heroic assumptions have to be made as to the depreciation rate for this knowledge. In order to broaden the scope of this investment in knowledge, data on investments in intellectual property and technologies embedded in high-technology goods have to be added. Both require substantial work, the first to capture all flows of intellectual property into and out of the region, and the second to assign a value to the knowledge embedded in each good or service traded.

From a policymaker's point of view the data, although crude, identify specific policy issues: external factors are less important than internal ones in influencing innovation. In particular the role of governments (both directly and indirectly through the trade shows and networks that they sponsor in BC) is relatively unimportant. What is important is the internal environment within the firm and feedback from their customers. For a corporate manager, the results clearly indicate the need to ensure that the firm is sensitive to signals from the marketplace. For government policy analysts the results might suggest the need to move away from direct support programs less visible programs designed to support the competitive environment. These results are preliminary and will require extensive additional analysis.

Another area requiring improvement is knowledge on the levels transfers from studies to employment. Given the high cost of post-secondary education, we need to know more 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, means that individual actor-network complexes have less individual influence on the system.

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 can all be innovative within their markets. In BC these industries tend to predominate outside the metropolitan areas, 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.

While the project is only at the beginning of the analysis of regional results in BC, the effects of geographical separation do appear to influence the responses. More detailed analysis of the data will suggest specific policy initiatives and improvements. The simple fact that government programs are much 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 complete knowledge economy infrastructure available in metropolitan areas.

Acknowledgements

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Appendix A: CPROST Innovation Survey for the Okanagan



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INNOVATION SURVEY

Please answer each of the following questions, on both sides of the page. If any question does not seem relevant to your company, please answer "Don't Know", or leave the line blank.

1.	<i>Has your company introduced any new products or processes in the past five years?</i>	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
1.1	<i>If yes, were any of these products or processes unique to your industry?</i>	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
1.2	<i>In general, how did this new product affect your company's:</i>	positively	no effect	negatively
	▶ Profitability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Cash flow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Market share	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Competitiveness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Quality of service	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Labour relations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	<i>How valuable are the following resources in developing new products and/or processes?</i>	crucial	valuable	not valuable
	▶ In-house R&D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Outsourced R&D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Sales & Marketing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Production	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Competitors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Customers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Suppliers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Professional networks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	<i>How do the following factors influence innovation in your company?</i>	help	no effect	hinder
	▶ Corporate culture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Management attitude	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Risk or reward of innovation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Development and/or production costs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Clients or customers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Competition	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Supplies of raw materials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Government policies and programs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Availability of personnel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Availability of financing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ Environmental concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.	Has your company updated or replaced capital equipment in the past five years?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
4.1	If yes, did the new equipment incorporate significant technological advances?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
5.	Does your company currently allocate any resources (time, money, and/or effort) to the development of new products and/or processes?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
6.	Has your company ever used a government incentive or assistance program for R&D? (for example, SR&ED or IRAP)	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
7.	MANAGEMENT OF INNOVATION			
7.1	Is there one person at your company responsible for managing innovation?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
7.2	Is your company able to measure the quality and effectiveness of its innovative practices?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
7.3	Does your company have any strategies in place to monitor current and potential competitors?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
7.4	Does your company have any strategies in place to identify, make, and manage strategic alliances?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
7.5	Does your company use any formal methods of forecasting and/or trend analysis?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
8.	HUMAN RESOURCES			
8.1	Does your company have programs, either formal or informal, for employee training and education?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
8.2	Do these training/education programs have provisions to incubate and spin-out new products or processes?	yes <input type="radio"/>	no <input type="radio"/>	don't know <input type="radio"/>
8.3	If your company requires specific new skills, capabilities, or knowledge, is it likely to:	yes	no	don't know
	▶ train a current employee	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ hire a new employee with the required skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	▶ engage a contractor or consultant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.	Please estimate the following:			
	▶ Percent of company's total sales outside BC			_____ %
	▶ Percent of company's total sales outside Canada			_____ %
	▶ Percent of company employees with post secondary education			_____ %
	Would you like to receive a copy of the results of this survey with your company positioned against the overall results for your industrial sector?	yes <input type="radio"/>	no <input type="radio"/>	
<p>Thank you for taking the time to complete this questionnaire. Please return it to the Centre for Policy Research on Science and Technology using the envelope provided. If you have any questions, please contact the Centre at (604) 291-5211</p> <p><small>This research has been conducted under the auspices of the Simon Fraser University Research Ethics Committee. All data collected will be treated as strictly confidential, and will be destroyed at the completion of the research. No individuals or firms will be in any way identified in any reports or publications based on this research. If you have any questions regarding these issues, please contact the principal investigator at (604) 291-5192 or the Director of the Simon Fraser University School of Communication at (604) 291-3657.</small></p>				