Innovation in Canadian Service Industries:

Results of a Pilot Study

Service Industries & Capital Projects Branch
Industry Canada

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EXECUTIVE SUMMARY

The changes in the Canadian economy towards a greater focus on service industries, knowledge-based firms and innovation have been apparent for many years. While there is general agreement on the importance of innovation to the continued success of the Canadian economy, the nature of the innovation process is not well understood with regards to service industries.

The purpose of this report on innovation in selected service industries is to develop better information on the innovative activities of firms and their economic impacts, and to contribute to the development of a larger survey of innovation in service industries being undertaken by Statistics Canada[1]. Because Statistics Canada's survey is so much broader, it will be possible to develop a more macro picture of the contribution of service firms to innovation in Canada. This Industry Canada report is based on interviews and an analysis of the 56 innovations reported by 50 service firms. The firms in question were in the geomatics, architecture, education and training, consulting engineering, security, logistics, wholesale trade and management consulting industries. The interviews were carried out by industry officers in the Service Industries and Capital Projects Branch of Industry Canada. The cooperation of the firms in responding to the questions so fully is greatly appreciated.

Earlier fundamental studies of the economic performance of the service industries (e.g. Industry Science and Technology Canada's 1989 Service Industries Studies Program) showed that the very rapid growth of the service sector in the post-war period was driven by the growth of new services and ways of producing services, particularly in respect of producer services. This growth was a vital part of a fundamental industrial change process in the economy whereby production systems were becoming more service and information intensive in the transition to a knowledge-based Canadian economy.

The survey results refute the often held public perception that service firms are not innovative and do very little research and development (R&D). Innovations in service industries occur because service firms are both developers and adapters of technology. Over the period 1987-1996, R&D in all service industries grew at a faster rate than R&D in other business

[1] The Statistics Canada survey is a comprehensive survey of 6,500 service firms in the consulting engineering, scientific and technical services, computer services, insurance and financial services and communications industries.

sectors. As a result, the share of R&D in service industries increased from 24.9 percent to 32.9 percent.[2] The majority of the service firms in this study were engaged in R&D activities.

The results of this survey of firms in the business and professional services industries strongly confirm the key role of innovation to the performance of Canadian service firms. Innovation was found to have been key to the growth of the service firms and to the creation of jobs by them. In addition to creating jobs, the firms' innovations raised the skills requirements of their employees, a demand which was met first and foremost by the retraining of workers and secondly by the hiring of new employees possessing the needed new skills. Almost one-half of the firms cited a positive impact of their innovation on their exports, and in the majority of these cases the impact was deemed significant.

Innovation involves much more than R&D and the survey results show the adaptive nature of service firms and that service firms are not just users but also adapters of technology. The successful firms noted that there was a need to be willing to commit resources to their innovations and identified several categories of non-R&D related expenditures that were required to successfully implement the innovations. This developmental and implementational work tended to be focused on information technologies and other knowledge-based activities.

The innovations reported were primarily world first or Canada first innovations. Product innovations were the most common reflecting the tendency of small firms, which made up a large proportion of the sample, to focus on product innovation. Reflecting their focus on product innovation, small firms are driven to innovate to take advantage of a new technology or to develop a new market or fill an existing market gap. Large firms, on the other hand, were more process oriented and sought to improve the efficiency or effectiveness of services delivery. Small firms derived a greater proportion of their sales from their innovations than did larger service firms.

The innovating firms tended to make significant investments in R&D and the majority of these service firms developed the technologies within the firm. However, in many cases, the firms were willing to rely on external sources for the needed technologies and used business alliances, joint ventures and the direct contracting out of R&D activities.

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[2] Statistics Canada (1966) "Total Spending on Research & Development in Canada, 1971 to 1996" **Service Bulletin, Science Statistics** Statistics Canada Cat. No. 88-001

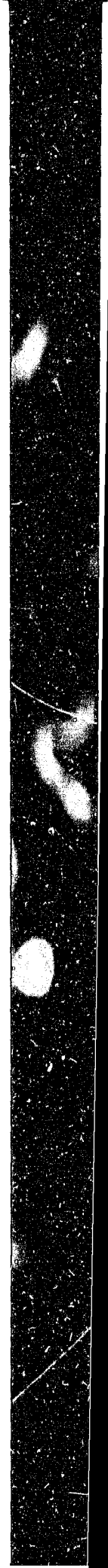
The survey did not collect expenditures data on the innovations, but it did attempt to determine whether firms could identify the types of expenditures required for service innovations and whether these activities were conducted within the firm or purchased from other companies. Although the largest proportion of firms indicated that they carried out a full range of innovative activities exclusively in-house, a large proportion of firms also reported combined in-house and contracted expenditures in developing their innovations. There was a increased tendency to purchase training, marketing and software services and to supplement in-house services the closer the innovation came to being launched into the marketplace.

The survey found that the majority of the firms reported R&D spending on their reported innovations over the 1990-96 period, but only 38 percent of the firms reported having ever applied for and received an R&D tax credit. This result would suggest that consideration should be given to determining if service industries are taking full advantage of the R&D tax credit and/or are aware of its availability. The low participation rate might also reflect that the current definition of R&D in the Income Tax Act is geared to supporting science-based activities as defined in the Frascati Manual. This definition does not capture other innovation related research and expenditures service firms must incur in order to innovate, an issue which can only be addressed through service innovation surveys.

For the purposes of this study, the number of workers allocated to R&D activities are used as an indicator of innovative activity. The greatest proportion of employees carrying out R&D tended to do so in R&D units in the firm (particularly the larger firms), with 66 percent of that employment on a part time basis. R&D is also carried out in other parts of the firm by a small number of employees. In addition, almost 20 percent of employees undertaking innovation related research are engaged in the non-technical, operational development work required to innovate in services (e.g. defining procedures and operating specifications, and data, information and intelligence gathering and analysis activities). Although statistics are collected on R&D expenditures in the natural science and engineering fields for the business sector, statistics on research expenditures in the social science field are not collected for the business sector. As social science R&D is more likely to be performed in the service industries than in other industries, we are likely particularly underestimating the resources devoted to innovating in service industries.

Finally, all of the firms had to overcome a number of challenges and obstacles to get their innovations to the marketplace. Both small and large firms ranked the lack of skilled personnel as their top impediment. Small firms also expressed concerns about financing and a lack of information. Large firms stressed, in order of importance, lack of expertise and lack of

information. These responses indicate that governments can continue to play an important role in promoting innovation, and thus growth and jobs, by promoting the development and diffusion of information and technology and the education and training necessary to endow the Canadian workforce with the skills required in Canada's growing, knowledge-based economy.



I INNOVATIONS THAT SERVICE FIRMS PURSUE

i) Characteristics of Participating Firms

The survey reports on 56 innovations that were introduced over the 1990-1996 period by 50 "typical" service firms. The Geomatics industry[3] contributed the largest proportion of the innovations (33 percent) followed by Architecture (18 percent), Education and Training (15 percent), Consulting Engineering (13 percent), Security (9 percent), Logistics (5 percent), Wholesale Trade (4 percent), Management Consulting (4 percent) and Other (1 percent). Multiple innovation reports were provided by five of the 50 firms.

The 56 innovations were relatively evenly split between firms having 25 or fewer employees (small firms) and those having more than 25 employees (large firms).[4] While small firms were over ½ of the survey participants, they represented only 3 percent of total employment. On average, the small firms in the sample employed 12 individuals while large firms employed 420.

The survey consisted mainly of smaller businesses, both in terms of employment and sales revenues. Firms that employed 50 or fewer workers accounted for 65 percent of the sample, with only one of those firms having revenues greater than $5 million. Conversely, only one firm employing more than 50 people earned less than $5 million (see Table 1).

Business and professional service firms are an integral element of the knowledge economy and have been in the forefront in pursuing the more knowledge- and technology-intensive activities driving the new economy[5] Much of the of the employment growth in this sector has been in skilled labour, and in 1995, almost 40 percent of employment for all services

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[3] The Geomatics industry is comprised of firms that manage geographically-referenced information, including its acquisition, storage, analysis, and dissemination.

[4] For the purposes of the report, small firms will consist of firms employing 25 or less employees and having sales of less than $2 million. Large firms will have more than 25 employees and sales greater than $2 million. There were only 2 situations where the firms could not meet both of the criteria for their respective categories.

[5] "Employment Performance in the Knowledge-Based Economy" Industry Canada Working Paper No. 14 December 1996

industries was of a white-collar high-skilled nature. Business and professional services firms have historically employed a large proportion of university educated and technically skilled workers. The firms participating in this survey reflect these employment trends.

The employment of professional, highly qualified and skilled professionals in the reporting service firms is high. Forty six of the fifty firms that participated in the survey, provided information on employment and the number of professional and highly skilled employees. Two thirds of the responding firms indicated that 60 percent or more of their employment was of a professional or highly skilled nature.

Table 1
Employment & Sales

Employment	Number of Firms	Sales		
		Less than $2 M	$2 M - $5 M	Over $5 M
1-25	26	24	2	0
26-50	6	2	3	1
> 50	17	0	1	16
Total	49	26	6	17

Note: 1 firm did not provide total employment data

ii) Nature of Service Industry Innovation

Innovation is at the heart of economic change. While the firms in this study strongly agree about its essential nature, there are also many facets to innovation. For this study, the definition of innovation had three components. **Product innovation**, was defined as either a new service (product) using an existing process or a new service using a new process. **Process innovation** was either a new process using a new technology to produce a service or as a new way of delivering services using a new technology. Finally, **organizational innovation** was defined as a new way of organizing a firm to produce or deliver services more effectively or efficiently.

Firms were polled as to the type of innovation that had been important to their success over the 1990-1996 period. The responses indicated that product innovation was the most commonly used, followed closely by process innovation and then organizational innovation.

Table 2 presents information on the reported innovations by type of innovation and firm size and shows that 48 percent of the innovative activities were directed towards the introduction of a new service. The 27 responses were about evenly divided between those that used an existing process and those that used a new process in developing the new service product.

Product innovation appears to have been relatively more important for small firms, while the type of innovation carried out by large firms appears to have been more evenly distributed, with some emphasis on process innovation. Product innovation by small firms in the sample were predominantly new services using an existing process, with the remaining innovations being a new service using a new process. In comparison, large firms preferred the latter form of product innovation.

Table 2
Types of Innovation in Service Industries

Type of Innovation	Small	Large	Total
Product (Service)	**19**	**8**	**27**
(i) new service using an existing process	12	2	14
(ii) new service using a new process	7	6	13
Process	**8**	**11**	**19**
(iii) new process using a new technology to produce a service	0	2	2
(iv) new way of delivering services using a new technology	8	9	17
Organization	**4**	**6**	**10**
Total	31	25	56

Of the process innovations, a significant proportion (17 of 19) involved innovative ways of delivering services with new technologies, suggesting a high correlation between process innovation and new technology use. Large firms were more active in producing process innovation. For both large and small firms, process innovation was predominantly oriented toward service delivery\technology innovations. However, large firms also developed innovations using a new process to develop new services.

The above results are consistent with the observation that advances in information and communications technologies are vital to service firms in developing new ways of delivering their services more widely and effectively. Surveys of technology use have confirmed the growing use of information and communications technology in the service industries. A 1997 survey[6] examined the diffusion of information and electronic commerce technologies among service industry companies in Canada. It found that communications and business services firms were the leading users of most electronic technologies, particularly office equipment and telecommunications technologies. In addition, the usage of more specialized business processes and applications of information technologies tended to increase with the size of the firms.

The 1997 study was an expansion and extension of a 1990 study[7]. While the results are not directly comparable due to different data sets, comparisons are possible for a subset of technologies. In 1989, 89 percent of all respondents used personal computers, and 3 percent planned to use them in the next 3 years, by 1996 95 percent of firms with 200+ employees were using personal computers, as were 80 percent of those with 20-199 employees. Similar growth can be seen in the usage of e-mail, video conferencing, computerized financial systems, computer-based training, desktop publishing, computer-aided software engineering, computerized inventory control, and point of sale terminals.

The remaining 10 innovations involved organizational innovations, showing that not all innovations depend on technology and natural sciences based research. This result would suggest that an emphasis on developing and improving management skills can also make a significant contribution to a firm's innovative performance.

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[6] Technologies in Service Industries: An Overview of the Use of Information Technology and Electronic Commerce in the Services Industries Industry Canada 1997

[7] Technologies in Services Industry, Science and Technology Canada and Communications Canada 1990

Innovation in service industries is complex and has special characteristics. It is more difficult to measure innovation in services than manufacturing industries and, as a result, there have only been pilot surveys of innovation in service industries (in Canada and other countries). These difficulties arise from the intangible nature of services themselves, the high degree of customization in many services, and the often close interrelationship between the development of new services and the processes to produce them. These difficulties were also experienced during this survey as there were a number of multiple responses to the question asking firms to classify the innovations by the definitions provided.

Half of the 16 multiple responses to this part of the survey indicated that it was not perfectly clear whether their innovation was a new service or a new way of producing and/or delivering a service (process). In addition, six firms indicated that their innovation was intricately tied to the organization of their firm, but should also be considered as either a service or product innovation. Multiple answers were clarified to the extent possible, for the preparation of Table 2. Despite these difficulties, the analysis of the results of the survey indicates the distinctions between types of innovation are useful and meaningful.

iii) Canadian Innovation - Best in the World

A large majority of the innovations introduced in the survey were considered leading edge activity. As Table 3 shows, respondents indicated that 82 percent of the innovations undertaken during the 1990-1996 period were a first, either in the world or in Canada. There was a similarity between small and large firms as to whether their innovations were considered as world or Canadian first. The percentage for small and large firms were 81 and 83 percent respectively.

Table 3
Originality of Innovation by Firm Size
(responses)

	Small Firms	Large Firms
World First	9	12
Canadian First	16	8
Imitative	6	4
Total	31	24

There was 1 no response

Of the 45 responses that believed their innovation to be a first of either kind, the majority in turn, believed the innovation to be a Canadian first. However, there was a major difference between the two groups in the allocation between world and Canadian first. Fifty percent of large firms reported their innovations as world firsts, while 29 percent of small firms thought their innovations were world firsts. Only 18 percent of the innovative activity was primarily imitative in nature as reflected by the response that it was neither a Canadian first nor world first.

Table 4
Originality by Type of Innovation (responses)

	All Innovations	Product	Process	Organization
World First	21	12	9	0
Canadian First	24	11	7	6
Imitative	10	4	3	3
Total	55	27	19	9

There was 1 no response

As shown in Table 4, new service (product) innovation had the highest proportion of world or Canadian first innovations. Of the 27 product innovations, 44 percent were a world first and 41 percent were a Canadian first. Process innovation had almost the same proportion (84 percent) of innovative firsts, but a slightly higher percentage (47 percent) of process innovations were world first in nature. Organizational innovations were predominately Canadian firsts. This may reflect the fact that it is much more difficult to develop or even identify a truly worldwide first, given that it must be compared against innovations from firms within its own industry grouping and the larger universe of service and non-service firms.

II SOURCES OF TECHNOLOGY AND EXPENDITURES ON INNOVATIONS

i) Know-How - The Foundation for Innovations

The survey has established the importance of innovative activities to service firms. The questionnaire also sought to explore the origins of the know-how or new technology used in the innovations, namely: research and development work within the firm; an arrangement or agreement with a source outside the firm (e.g. licensing); or a combination of these two sources (e.g. joint venture). Table 5 reports the sources of the innovations.

Table 5
Primary Sources of Technology for the Innovations

Source	Within the Firm			Outside the Firm			Combination		
Type	Imitative	Canada	World	Imitative	Canada	World	Imitative	Canada	World
Product (21)	1	2	6	1	4	1	1	2	3
Process (17)	1	3	6		1	1		3	2
Organization (3)	1	2							
Total (41)	22			8			11		

Only 41 responses were completed in sufficient detail for this table.

Innovation research in the manufacturing sector has found that new products and processes were generally developed in-house. The survey results suggest that the same can be said for service firms. Table 5 shows that, for the majority of innovations, the technology was developed within the firm. However, the tendency for some firms to obtain technology from outside the firm, either in whole or in part, is also significant.

In the survey, 8 of the 18 world or Canadian first product innovations came from within the firm. Another 5 were cooperative ventures; with the remaining 5 product innovations being sourced outside the firm. Of the 16 process innovations that were either a world or Canadian first in nature, 9 originated within the firm; 5 involved joint efforts between the firm and outside sources, and two were sourced outside the firms. Finally, the 3 organizational innovations reported were conceived and developed in-house.

Firms that obtained the know-how for their innovations outside the firm were asked to indicate their sources. The results, reported in Table 6, indicate the method of technology transfer. It should be noted that the responses were based on the technologies that were identified as having been externally sourced in Table 5 (Outside the Firm and Combination) and firms were allowed to give multiple responses. The results indicate that where an external source is used to acquire know-how, suppliers are the most frequent source, followed by joint ventures, technology centres and the parent company. For the most part, it would appear that service firms are similar to manufacturing firms in this regard, except that due to the higher foreign ownership in manufacturing, there is a greater reliance on parent firms for technology than is the case for service firms.

Table 6
Primary Sources of Technology for the Innovation

Source	Responses
License with Supplier	7
Joint Venture	5
Technology Centre	5
Parent Company	5
Other	3

Another important consideration is the country of origin of the technology used in the innovations, either Canadian or world firsts. Fourteen of 49 innovation responses indicated that the source was of a foreign nature. As a further refinement, firms were asked about the country of origin for the innovations that supported the Canadian first innovations. While there were few responses, in the majority of the cases (5 of 8 responses), the country of origin was the U.S.

ii) Nature of the Costs of Service Innovations

Firms were asked to report the types of costs they incurred in innovating and whether these expenditures were made in-house or by purchasing the service in the marketplace. Table 7 summarizes the activities involved in the innovation process and suggests that to innovate service firms must undertake the full range of activities identified in the innovation literature, from R&D

to marketing and skills development.[8] A consistent theme from the results is the reliance on internal resources for activities such as R&D, operational development, training and marketing. Entries in the no expenditure column means that the firms did not have expenditures for a given category, even though they had other expenses to successfully implement the innovations. For example, 6 of the 8 organizational innovations did not require R&D expenditures.

Table 7
The Nature of Costs Involved in Services Innovation (responses)

Activity	Exclusively In-House		Exclusively Purchased		Combination		No Expenditures	
	Small	Large	Small	Large	Small	Large	Small	Large
Research & Development	20	12	1	1	5	6	4	4
Operational Development	13	22	1	2	1	8	1	4
Training	12	19	3	1	4	7	8	2
Marketing	15	13	1	0	5	7	10	3
Software	7	6	8	3	8	5	12	6

The major difference between large and small firms appears to be with respect to research and development expenditures. Small firms appear to carry out their R&D exclusively in-house more frequently than do large firms but large firms appear to carry out all other activities more frequently in-house than do small firms.

[8] **Research and Development** was defined as investigative work to acquire scientific or technical knowledge; to devise or develop new services or processes for services; or to apply newly acquired knowledge in making technically significant improvements to services or processes. **Operational Development** encompassed non-technical activities related to the acquisition of information and data and the defining of procedures, specifications and operational features necessary for the introduction of the innovation. **Training** included only those activities for the development and introduction of the new service, process or organization change. **Marketing** included only those costs necessary for the launch of a new service. **Software** costs included acquisition, development and maintenance of software; excluding software incorporated in the hardware. **Investment** in plant and machinery and equipment was linked to the introduction of a new service or process, including software in the hardware.

In both groupings, there appears to be a greater tendency to supplement in-house development by purchasing services, in whole or in part, as the firm progresses from the relatively more fundamental innovation stages (i.e. R&D and operational development) to preparation and introduction of the innovation into the marketplace (i.e. marketing, training and software requirement). Of note, large and small firms had a tendency to place greater reliance on outside resources for software requirements involved in the introduction of the innovation.

The final category of innovation expenditure was investment in machinery and equipment and physical plant. Small and large firms were quite similar in their response, as 68 percent of the small firm subset indicated that their innovations required capital investments, while 64 percent of the large firms replied in a similar manner. This result illustrates some of the different influences on costs structures that innovations create. While innovations are expected to generate possible labour and other input resource savings, firms are also required to spend money on capital, training etc. As will be shown in Table 14, the net effect of the innovations was generally to lower the costs of the surveyed firms.

The discussion above focuses on types of innovation-related expenditures and changes in the level of those expenditures. Firms were also asked if they could provide a rough estimate of their actual expenditures on innovation-related activities and most of them indicated that it was possible. While this survey did not collect this information, the responses indicate that it would be possible to conduct future research that explores further the linkages among innovations, their costs and their influences on the firms. Data availability for service firms has been one of the major impediments in conducting this kind of research.

Innovation is conducted to give firms a competitive advantage and/or maintain existing market share. Is the protection of a firm's intellectual property an important consideration? Services firms generally do not appear to rely on formal patent protection because of the nature of their businesses. This was supported by the survey results, where only 11 innovations had any form of formal protection, and, as would be expected, this is usually copyright protection.

III MANAGEMENT ISSUES

i) Drivers of Innovation

Economic theory suggests a number of reasons why firms innovate, including to increase profitability, to enhance productivity, to gain cost advantages, to strengthen competitive positions, and to gain competitive advantages. Expanding on the investigation of what motivates innovative activity, firms were asked to indicate and rank the most important factors in their decision to adopt the innovation (Table 8).

Table 8
Key Factors Leading to the Adoption of Innovation in the Service Sector

Factor	Small	Large	Total
Perception of a new market or market gap	23	13	36
Gain a larger market share	11	19	30
Improve effectiveness & efficiency of service delivery	12	17	29
Take advantage of a new technology	20	7	27
Other	6	5	11
Suggestion from customers	6	4	10
Reduce labour requirements	3	5	8
Response to foreign competitors	3	3	6
As a result of declining profit margins	3	1	4
Suggestion from suppliers	1	0	1
Response to domestic competitor	1	0	1
Reduce capital requirements	1	0	1

The survey revealed some interesting results, with 4 factors receiving significantly more responses. First, service firms appear to be opportunists and are keenly aware of the dynamic

nature of their marketplace. This is reflected in the most frequently given response: perception of a new market or gap in an existing market, where it was ranked first 30 out of the 36 times it was cited. (Firms were asked to rank the top 3 factors.) All of the security firms (5) and half of the geomatics, consulting engineers and architects responded in this manner.

Reflecting the opportunistic nature of service firms, the next 3 factors in terms of importance were: to gain a larger market share; to improve the effectiveness and efficiency of the delivery of a service; and to take advantage of a new technology.

Comparison of the small and large firm responses reveal some interesting differences. The differences between large and small firms, in part, reflect the different types of innovation performed by the firms. Small firms have a greater emphasis on product innovation than large firms. This small firm emphasis on product innovation is reflected in their top response, to take advantage of new markets or gaps in an existing market; while large firms cited improved effectiveness and efficiency of service delivery as the most important stimulus for innovation.

Similarly, the second and third most important factors for small firms were to take advantage of opportunities posed by a new technology and to gain a larger market share. These factors are often driven by the desire or need to introduce new products or services.

As Table 8 illustrates, large firms are more involved with process innovation and this is reflected in the groupings first choice, namely, to improve the effectiveness and efficiency of service delivery. The second and third choice were to gain a larger market share and the perception of a new market or market gap, respectively. These choices are also consistent with process innovation, as presumably large firms will offer a range of services and products and the improved company processes will help them to obtain the latter two objectives.

ii) Barriers and Impediments to Innovation

Given that many good ideas do not make it in the marketplace, the firms were asked about their perceptions of the impediments and challenges successful innovations must overcome. Table 9 presents the results and shows that there were many similarities in perceived impediments between those suggested by small and large firms.

Table 9 Perceived Impediments to Service Innovation by Firm Size			
Impediment	Small Firms	Large Firms	Total
Skilled Personnel	11	8	19
Information	10	7	17
Financing	11	6	17
Other	10	5	15
Expertise	7	7	14

The lack of skilled personnel ranked first on the list of impediments for both small and large firms. This result reflects similar comments in manufacturing industries where technical expertise has also been identified as a significant impediment to innovation. Small firms indicated that financing and a lack of information were other important impediments to successfully introducing innovations. Large firms were also concerned about a lack of information and a lack of expertise. Not surprisingly, financing was much lower on their list.

iii) Where Do Good Ideas Come From?

Continuous innovation relies on a steady stream of new ideas. Table 10 summarizes the main sources of the ideas and information used by the firms in the generation and development of their innovations. Firms were asked to rank the three most important sources and the results in Table 10 are ranked by the number of times they were cited.

The results reinforce anecdotal evidence of the increasing importance of the customer in the marketplace for services. Customers were cited as the most important source for generating new ideas for the (service) firm and were ranked slightly ahead of the firm's management team and R&D group. Unlike in manufacturing firms, suppliers are a less important source of ideas for service innovators.

Table 10 shows that large and small firms appear to rely on somewhat dissimilar sources for innovative ideas. The primary source of innovative ideas for small firms is the R&D group followed by management and customers. For large firms, the customer was most often cited as a

key source of ideas for innovation followed by management. The firm's R&D group and production personnel were equally important in identifying innovative opportunities.

Table 10
Sources of Ideas for Services Innovation

Source	Small Firms	Large Firms	Total
Customers	11	17	28
Management	12	14	26
R&D Group	14	6	20
Production Personnel	3	6	9
Suppliers	4	4	8
Competitors	4	3	7
Marketing Personnel	2	4	6
Government Research Centre	5	1	6

iv) Innovation Champions

Most innovations or new ideas require champions to be usefully implemented. The survey sought to determine who was instrumental in seeing that the innovation was carried through and, in effect, played the role of champion. Given that the source of the majority of the innovations for both small and large firms was within the firm itself, the question concerning the position of the key individuals was most appropriate. Many of the firms interviewed were small, and ownership should be expected to participate directly in their day-to-day operations. Table 11 illustrates this point, as the most frequent response was the owner or president. Reflecting the nature of many small service firms, the second most frequent reply was the principal or partner. In the case of large firms, other responses indicated that a vice-president or manager was often an important part of the innovation adoption process.

Table 11 Innovation in Service Firms - Champions	
Position	Responses
President, CEO, Chairman	21
Principal/Partner	14
Manager/Specialist	9
Vice-President	6
Other	4
Total	54

v) Innovations - Time to Market and the Pay Backs

The reasons for pursuing innovations have already been discussed, but an important consideration for firms is how long it will take them to get the innovation from the conceptual stage to the market place. Observations were available for 19 world first innovations, 23 Canadian firsts innovations and the 6 innovations in the imitative category. The survey results indicate that, as expected, world first innovations take longer to develop and introduce into the marketplace; on average 18.1 months. The figures for Canadian firsts and imitative innovations were 12.5 months and 11.8 months respectively. Small and large firms took about the same time, on average, 14.6 months and 14 months respectively, to introduce an innovation.

While innovations are important to the firms for the reasons presented in Table 8, the firms also kept a careful watch on their impacts on their balance sheets. In general, firms achieved a short pay back period for their innovations. The majority of the innovations (37) had a pay-back period of less than three years, with 9 involving a pay-back period of 3-5 years. Only 4 firms indicated that it took more than 5 years to recover costs and earn profits from their innovations. Comparing by size, large firms also experienced a faster payback period than did small firms. The majority of large firms, 81 percent compared to 75 percent for small firms, indicated a pay-back period of less than three years.

vi) Who Are the Customers?

Firms were asked to list the most important class of customer to whom they sold their services and for whom they felt the innovations had made a difference. As the results in Table 12 indicate, the major market for the innovations was domestic customers, however, there was still a strong international component to their clientele list. In Canada and in foreign markets, the private sector was the most frequently cited customer group, with a slight emphasis on industrial firms in Canada. However, a significant number of responses also indicated that governments and institutions were important customers. As will be discussed in greater detail below, foreign clients are important to the surveyed firms as the exporters earned, on average, 35 percent of their sales from foreign sources.

Table 12
Customers using the Innovations

Customer	Canadian	Foreign
Private Firms	42	19
Industrial	(22)	n/d
Services	(20)	n/d
Government/ Institutional	19	12
Client/Consumer	8	n/d
Other	n/d	3

n/d - not enough detail to complete the entry

IV IMPACTS OF THE INNOVATION

i) Perceived Importance of Innovation

Almost all of the firms surveyed expressed a strong belief that innovation is an integral element of their business. The importance of innovation is further reflected in the fact that in the six year period covered by this survey, over one-third said they had introduced more than one world or Canadian first innovation.

Firms were asked the general question of which type of innovation was relatively more important to their success: service innovation, process innovation or organizational changes. Although some firms provided multiple responses, they were closely divided between service and process innovation. Thirty responses (43 percent) indicated that service innovation was relatively more important, 29 (42 percent) supported process innovation and 10 (15 percent) favoured organizational change.

ii) Impact of Innovation on the Firm

The majority of service firms in the sample were in general agreement that innovations had been critical to the success of their business. The importance of innovation to service firms is more tangibly reflected in the proportion of sales directly attributable to the innovations. As Table 13 shows, over 80 percent of the small firms and almost 70 percent of the large firms indicated that at least 25 percent of their revenues was due to their innovative activity.

Table 13
Impact of Innovations on Sales

	Small Firms	Large Firms	Total
Less than 25 %	5	7	12
25 to 50 %	12	5	17
Greater than 50 %	12	10	22

As illustrated by Table 14, service innovations appear to have the greatest impact on the sales and marketing function. The design functions performed by the firm were also frequently indicated as having been affected. Several firms reported that the impact of the innovation had

broad consequences, to the extent that all functions were in some way affected. These observations complement the earlier findings about the difficulties involved in distinguishing among types of innovations. While firms can identify most of the benefits of innovations, it is often difficult to give an exact responses about their influences and impacts.

Table 14
Functions/Activities Most Affected

Function\Activity	Responses
Sales\Marketing	27
Design	10
All	7
Production	4
Service	3
Other	3

Table 15 summarizes the respondents assessments of the degree of impact of the innovations on selected performance measures. In general, the innovations had the greatest impact on the firms' relationship with their customers and sales, presumably due to improved levels and quality of service. This result holds for both product and process of innovations.

In addition to the influences on sales and customers, product innovation appears to have a strong impact on suppliers and the level of capital expenditures and the least effect on export sales. The majority of product innovations were undertaken by small firms. Process innovation, on the other hand, seems to have had a positive impact on export activity, costs and capital expenditures. Many process innovations were geared to finding new ways to deliver services more effectively. Overall, 43 percent of innovative activity impacted export activity to a greater or lessor degree. Also, many service firms do business internationally via foreign offices or affiliates rather than in a direct export mode. Suppliers were the most frequently unaffected, which would be expected due to the nature of process innovations and the nature of the suppliers business relationships with the innovating firms.

Table 15 Impact on Firm Performance by Type of Innovation						
	Degree of Impact					
	Product Innovation			Process Innovation		
Function	Significant	Marginal	Not at All	Significant	Marginal	Not at All
Sales	14	11	1	12	5	1
Costs	4	14	8	6	7	5
Exports	6	3	17	9	1	8
Capital Exp	11	8	7	6	6	6
Customers	21	5	-	17	-	1
Suppliers	12	6	8	5	2	11

Table 15 based on 26 product and 18 process innovations.

iii) Exporting Services

According to the World Trade Organization (WTO), knowledge intensive services represent one of the fastest growing components of world trade. This rate of growth is expected to continue until at least the end of the decade as the high rates of growth in developing countries are expected to fuel the demand for business and professional services. Over the past 15 years, exports of business and professional services have been one of Canada's success stories. Canadian service firms are aware of the importance of export sales to their success and the survey results reflect their commitment to the international marketplace.

Table 12 illustrates that foreign customers are a major influence on their operations and Table 15 shows that the surveyed innovations made a considerable contribution to export sales. In addition, 36 of the 56 responses reported deriving revenues from foreign sales. Eighteen of the exporters reported that foreign sales were less than 25 percent of their total sales, 8 reported foreign revenues between 25 and 50 percent of their sales, while the remaining 10 reported that over 50 percent of their sales were generated in foreign markets. The average foreign sales for exporters was 35 percent of their revenues. This highlighting of foreign markets is important as the advanced countries are increasingly of the view that the exporting of knowledge intensive

services is the route to success in the international marketplace. A steady stream of innovations could be regarded as an essential cog in helping Canadian firms expand their market share.

The exporting of services is generally regarded as more difficult than the exporting of goods. Due to the intangible nature of business and professional services, many of these services require that the providers be within close proximity of their customers. Firms in the survey most frequently report that access to foreign markets via exports took place through some form of partnership arrangement, including the use of agents, local partners or other representatives. Other responses to the question included visits to the country of interest and through subsidiaries or offices sometimes in conjunction with a parent company.

iv) Workforce Effects

As noted in Section I, two-thirds of the surveyed service firms already have 60 percent or more of their employees in professional and high skill jobs. The innovations adopted by both large and small firms augmented this situation as the firms reported that they were generally labour augmenting and raised their employees' skill levels. As shown in Table 16, eighty-one percent of the large firms experienced a net increase in employment levels, with the comparable figure for small firms being 60 percent. Only one small firm reported that employment underwent a net decrease due to the adoption of an innovation.

In addition to increasing employment, 82 percent of large firms and 59 percent of small firms reported that employees' labour skill requirements rose as a result of the innovations. Firms were asked whether they hired additional staff from outside the firm or whether they relied on the retraining of additional staff to achieve the higher skill levels warranted by the innovation. In the majority of cases, new skills were obtained by in-house retraining. When the required resources were not available internally, firms then obtained the new skills by hiring personnel from outside the firm. These results complement the findings reported in Table 7 which illustrate the surveyed firms commitment to training, especially in-house training.

Table 16 **Work Force Effects (Responses)**				
	Effects on Employment		Effects on Skill Levels*	
	Large Firms	Small Firms	Large Firms	Small Firms
Net Increase	17	21	14	19
Negligible	4	13	3	12
Net Decrease	0	1	0	1
Total	21	35	17	32
* Seven firms reported that their innovation had no effects on skills levels				

Table 17 **Employee Skills Upgrading - The Techniques***						
	Hired Outside the Firm		Trained In-House		Trained Outside the Firm	
	Large Firms	Small Firms	Large Firms	Small Firms	Large Firms	Small Firms
Increase	6	12	13	12	0	2
Negligible	1	1	3	12	2	2
Decrease	0	1	0	0	0	0
* Multiple responses were possible						

V DEPLOYMENT OF INNOVATION RESOURCES WITHIN THE FIRM

i) Innovation Research Expenditures

At the firm level, the survey asked respondents to indicate how much they had spent on R&D activities in 1995. The level of expenditures on R&D (as opposed to the broader category of innovation) varied widely among the firms in the sample, from none to $10 million. The 34 respondents that reported a figure for 1995 R&D expenditures, on average, incurred $1.11 million in expenditures. However, relatively few took advantage of the federal government's tax credit incentives. Only 38 percent of the sample had applied for and received an R&D tax credit in the past, as compared to 61 percent which reported R&D spending in 1995 alone. Also, as shown in Table 7, over 80 percent of the surveyed innovations over the 1990-96 period required R&D expenditures by the firms. Of the remaining 8 innovations, 6 were organizational innovations which typically do not require R&D expenditures.

To assess the intensity of R&D expenditures by service firms, a number of statistics were calculated and presented in Table 18. Twenty-nine firms in the survey provided information on their employment, the number of professionals employed and the number of research employees and their total expenditures on R&D for 1995. The results are interesting, both in terms of the magnitudes presented and in comparison to past research that examined similar expenditures in the manufacturing sector. Table 18 shows that service firms are relatively R&D intensive. Small firms spend more than large firms on R&D when measured on a per employee or per professional basis. However, the R&D intensity per researcher of large firms is higher than in small firms.

Table 18
R&D Intensity by Firm Size (1995)

	Small Firm	Large Firm	Sample
R&D per Employee	$11,495	$5,825	$6,047
R&D per Professional	$15,129	$11,248	$11,490
R&D per Researcher	$24,947	$38,973	$37,411

ii) Innovative Workers - Their Place in the Firm

Economists generally agree that it is difficult to assess the impact of knowledge on economic performance since knowledge is inherently differentiated and difficult to quantify. No standard definition exists for high-knowledge industries, and researchers have attempted to classify industries according to their knowledge intensity, they generally used a single characteristics for measuring knowledge[9]. In addition, the OECD has developed the Oslo Manual[10], which is a set of guidelines for collecting and interpreting technological innovation data which statistical agencies in members countries can rely on in developing survey questionnaires. Given the nature of this survey, the main indicator of innovative effort is the number of workers allocated to R&D activities. Table 19 summarizes how employment is allocated to innovation research by service firms.

Table 19
Innovation Research Employment by Firm Size

	R&D Unit		R&D in Other Departments		Other Research		Total	
	Small	Large	Small	Large	Small	Large	Small	Large
None	0	0	1	0	0	0	1	0
Full Time	11	106	0	9	1	4	12	119
Part Time	28	206	8	33	45	42	81	281
Total	39	312	9	42	46	46	94	400

Survey respondents indicated that most innovation research consisted of R&D carried out in a formal R&D unit. The other methods identified, in order of preference, were innovation research geared to data, information and other intelligence gathering activities and R&D pursued

[9] For a more detailed discussion of the measurement difficulties and how some researchers have attempted to deal with them see "Employment Performance in the Knowledge-Based Economy" Industry Canada Working Paper No. 14 pages 7 and 8.

[10] OECD (1997) Oslo Manual 1997 Paris This latest version of the Oslo Manual has been revised to better capture some of the unique aspects of service innovations.

in non-R&D units within the firm. Employment was concentrated in the R&D departments and most innovation research employment was typically of a part time nature[11]. On average, firms in the sample employed 17 individuals to carry out innovation research activities.

In general, small firm innovative activity is research of a non-traditional nature. Over ½ of employment was geared to research of a non-tradition nature including information, data and intelligence gathering and almost all of it was on a part-time basis. Even so, 41 percent of the employees engaged in innovation research in small firms were situated in formal R&D units.

Large service firms also appear to carry out innovation research primarily on a part-time basis, but are more likely to utilize a formal R&D unit than small firms. One-half of the large firms indicated that R&D was performed in R&D units, which is where 80 percent of large firm research employment is located. Reflecting one of the major differences between large and small firms (emphasis on process versus product innovation), only 12 percent of large firm research, in terms of employee engagement, was devoted to gathering data, information and other intelligence.

[11] One firm, which reported a very large number of full time employees carrying out Other Research was excluded since this would dramatically skew the employment variable upward.