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Science, Innovation and Electronic Information Division

Innovation in Selected Professional, Scientific and Technical Services: Results from the Survey of Innovation 2003

2001-2003

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^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published

Note
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Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

The Science and Innovation Information Program

The purpose of this program is to develop **useful indicators of science and technology activity** in Canada based on a framework that ties them together into a coherent picture. To achieve the purpose, statistical indicators are being developed in five key entities:

- **Actors**: are persons and institutions engaged in S&T activities. Measures include distinguishing R&D performers, identifying universities that license their technologies, and determining the field of study of graduates.
- **Activities**: include the creation, transmission or use of S&T knowledge including research and development, innovation, and use of technologies.
- **Linkages**: are the means by which S&T knowledge is transferred among actors. Measures include the flow of graduates to industries, the licensing of a university's technology to a company, co-authorship of scientific papers, the source of ideas for innovation in industry.
- **Outcomes**: are the medium-term consequences of activities. An outcome of an innovation in a firm may be more highly skilled jobs. An outcome of a firm adopting a new technology may be a greater market share for that firm.
- **Impacts**: are the longer-term consequences of activities, linkages and outcomes. Wireless telephony is the result of many activities, linkages and outcomes. It has wide-ranging economic and social impacts such as increased connectedness.

The development of these indicators and their further elaboration is being done at Statistics Canada, in collaboration with other government departments and agencies, and a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and we are continuing with our efforts to understand the characteristics of innovative and non-innovative firms, especially in the service sector that dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say only *how much* the federal government spends and *where* it spends it. Our report **Federal Scientific Activities, 1998 (Cat. No. 88-204)** first published socio-economic objectives indicators to show *what* the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information has been used to provide a context for performance reports of individual departments and agencies.

As of April 1999, the Program has been established as a part of Statistics Canada's Science, Innovation and Electronic Information Division.

The final version of the framework that guides the future elaboration of indicators was published in December, 1998 (**Science and Technology Activities and Impacts: A Framework for a Statistical Information System,** Cat. No. 88-522). The framework has given rise to **A Five-Year Strategic Plan for the Development of an Information System for Science and Technology** (Cat. No. 88-523).

It is now possible to report on the Canadian system on science and technology and show the role of the federal government in that system.

Our working papers and research papers are available at no cost on the Statistics Canada Internet site at http://www.statcan.ca/cgi-bin/downpub/research.cgi?subject=193.

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Finally, the author would also like to thank the 2,123 selected services firms who completed the questionnaire. Without their cooperation and goodwill, this working paper would not have been possible.

Executive Summary

Incidence and types of innovation

A minimum of almost one half of establishments in all of eight selected professional, scientific and technical services industries were innovative. "Computer systems design and related services" reported the highest percentage of innovators at 87%, while "Total management, scientific and technical consulting services" establishments reported the lowest percentage of innovators at 47%.

Types of innovators (product, process or both) varied by industry.

Novelty of innovation

At least three in ten of all innovators in each of the selected professional, scientific and technical services industries reported a Canada-first innovation. Over one half of all establishments in "Total research and development services" reported having a world first innovation.

Sources of information

The most frequently indicated sources of information contributing to innovation for selected professional, scientific and technical industries were research and development staff; management staff; clients or customers; professional conferences, meeting and journals; and the Internet.

Innovation activities

Internal R&D, acquisition of machinery and equipment, and training were the most frequently indicated innovation activities amongst innovative firms in professional, scientific and technical services.

Co-operation and collaboration

Most innovative establishments indicated that innovations were developed mainly within the firm and not in co-operation with other organizations or primarily by other organizations.

Problems and obstacles to innovation

Economic problems and obstacles were generally more prevalent than internal or other problems and obstacles; the most frequently indicated economic problem varied by industry. Inability to devote staff on on-going basis due to production requirements was the most frequently reported internal problem. Lack of customer responsiveness was the most frequently reported amongst the "other" problems.

Government support for innovation

A minimum of one in five establishments reported using government R&D tax credits in each of the professional, scientific and technical services industries. Amongst the other government support programs, the most commonly used were government information or internet services and government support for training

Impacts of innovation
The most frequently indicated impacts of innovation were allowing the business to keep up with its competitors and improved product (goods or services) quality.

Reasons firms do not innovate
Lack of market demand was the most frequently indicated reason for not developing new or significantly improved products (goods or services) or processes.

Preface

Innovation and the adoption and dissemination of technologies and practices are vital to economic growth and development. It is through innovation that new products are introduced to the market, new production processes are developed and introduced, and organisational changes are made. Through the adoption of newer, more advanced, technologies and practices, industries can increase their production capabilities, improve their productivity, and expand their lines of new goods and services.

In 1993, the first survey of innovation and the adoption of advanced technologies in the Canadian manufacturing sector was carried out at Statistics Canada. It was followed in 1996 by a survey conducted by the Science, Innovation and Electronic Information Division (SIEID) of innovation in the communications, financial services and technical business services industries. The Survey of Innovation, 1999 surveyed manufacturing and was the first innovation survey of selected natural resource industries. The Survey of Innovation, 2003 concentrated on innovation activities in selected service industries, including all of the service industries in information communication technology, selected professional, scientific and technical services, selected transportation services and selected natural resource support services industries.

The SIEID carried out biotechnology surveys in 1996, 1997, 1999, 2001 and 2003 which examined both the development of new biotechnology products and processes and the use and planned use of biotechnologies. The 2003 Bioproducts Development survey was also conducted. The 1999 Survey of Innovation, Advanced Technologies and Practices in the Construction and Related Industries was the first survey of the innovation and advanced technologies and practices in the construction sector. A number of surveys have focused on the use and planned use of advanced technologies and practices: surveys of advanced manufacturing technologies were carried out in 1987, 1989, 1993 and 1998; and surveys of the use and planned use of information and communication technologies have been carried out annually since 1999.

This working paper, on innovation in selected professional, scientific and technical service industries, is one of a series of four descriptive working papers which provide an overview of the results of the Survey of Innovation 2003, and is part of a series of products that will present and analyse the data from this survey.

Introduction

Innovation may be thought of as the transformation of knowledge into economic activity, a continuum running from invention to commercialization (bringing the new product to the market or the new process to the workplace). From this perspective, innovation performs a vital role contributing to economic growth and development. Through innovation, new products are introduced into the marketplace, new production processes are developed and organizational changes are made.

Professional, scientific and technical services industries represent a growing part of the economy, increasing from 3% of GDP in 1994 to 4.5% of GDP ten years later. They also represent high-value employment; with average wages and salaries greater than those found in the economy as a whole. From this industry group (NAICS 54) five five-digit industries and three four-digit industry groups were selected for the Survey of Innovation 2003[1]. These industries engage in significant amounts of research and development, particularly compared with other industries in the service sector. These industries were selected based on the importance of knowledge synthesis and generation to the services provided and their role in transmitting knowledge through the economy. This role makes them a key part of Canada's national system of innovation.

This paper is divided into five sections and three appendices. The first section will examine the nature of innovation; the second will describe how innovation takes place. The third section will explore factors that may impact the decision to innovate such as obstacles and incentives. The fourth section will examine the impacts of innovation. The fifth section will look at why some firms chose not to innovate. Finally, three appendices will provide the NAICS (North American Industry Classification System) description for each of the industries covered in this paper, tables containing estimates with reliability measures for all data included in this paper and an overview of professional, scientific and technical services industries in terms of their contributions to GDP, employment and R&D spending.

The Survey of Innovation 2003

The data used in this paper are from the Survey of Innovation 2003. The Survey of Innovation 2003 is the second survey of innovation in Canada to examine industries in the service sector. The Survey of Innovation, 1996 examined innovation in selected dynamic service industries including communications, financial services and technical business services[2].

1. Two of the four-digit industry groups, 5416 (Total management, scientific and technical consulting) and 5417 (Total research and development services) have estimates for their component industries.
2. Baldwin, John, Guy Gellatly, Joanne Johnson and Valerie Peters (1998), *Innovation in Dynamic Service Industries*, Statistics Canada, Catalogue No. 88-516-XPB; Hamdani, Daood, *Innovation in the Engineering Services Industry*, Statistics Canada, Services indicators. Vol. 6, no. 3 (3rd quarter 1999), Catalogue No. 63-016-XPB, PP.19-30; and Gellatly, Guy, *Differences in Innovator and Non-innovator Profiles: Small Establishments in Business Services*, Research paper series (Statistics Canada. Analytical Studies Branch); no. 143, Catalogue No. 11F0019MPE no. 143.

This survey was conducted pursuant to the guidelines set out in the Oslo Manual[3]. The target population for the Survey of Innovation 2003 was establishments operating in Canada in selected service industries including all ICT[4] industries in the service sector; selected knowledge-based "Professional, scientific and technical services" industries; industries serving mining and/or forestry or forest products; and selected "Transportation industries". To reduce the response burden on small businesses, only establishments with at least 15 employees and at least $250,000 in revenues[5] were considered in sample selection[6].

The questionnaire was directed to establishments. "The establishment is the level at which the accounting data required to measure production is available (principal inputs, revenues, salaries and wages). The establishment, as a statistical unit, is defined as the most homogeneous unit of production for which the business maintains accounting records from which it is possible to assemble all the data elements required to compile the full structure of the gross value of production (total sales or shipments, and inventories), the cost of materials and services, and labour and capital used in production."[7] In the questionnaire, establishments were referred to as "business units" as this terminology was found to be more familiar to respondents completing the survey. Establishments were also asked whether or not they belonged to larger firms, which corresponds to the statistical concept of the enterprise.

Eleven selected professional, scientific and technical services industries were sampled, with 1,709 sampled establishments representing a total of 6,534 establishments. Table 1 contains a detailed breakout of population, sample and response rate by industry.

3. OECD/Eurostat (1997), *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (Oslo Manual)*. Paris: OECD
4. The definition of Information and communications technology (ICT) industries is found on the Statistics Canada web site: http://www.statcan.ca/english/Subjects/Standard/spec-aggreg/ict-2002/ict02-menu.htm.
5. Revenues and number of employees were obtained from Statistics Canada's Business Register, December 2002.
6. Details on the Survey of Innovation 2003 are available on the Statistics Canada web site: http://www.statcan.ca/english/sdds/4218.htm
7. Source: http://www.statcan.ca/english/concepts/stat-unit-def.htm

Table 1: Population, sample and response rate for selected professional, scientific and technical services industries, 2003

NAICS (2002)	Description	Population	Sample	Response rate
54133	Engineering services	1,356	348	74.2%
54136	Geophysical Surveying and Mapping	115	56	84.8%
54137	Surveying and Mapping (except Geophysical)	129	90	75.6%
54138	Testing laboratories	188	107	80.2%
54142	Industrial Design Services	51	38	90.9%
54151	Computer System Design	2,178	338	65.8%
5416	Total management, scientific and technical consulting services	1,933	482	78.7%
54161	*Management Consulting Services*	*1,568*	*266*	*76.1%*
54162	*Environmental Consultants*	*120*	*87*	*73.8%*
54169	*Other Scientific and Technical Consulting Services*	*245*	*129*	*87.4%*
5417	Total research and development services	584	250	73.6%
54171	*R&D in Physical, Engineering and Life Sciences*	*480*	*174*	*74.6%*
54172	*R&D in the Social Sciences and Humanities*	*104*	*76*	*71.2%*

Source: *Statistics Canada, Survey of Innovation 2003*

This working paper presents information on eight industries and industry groups. "Total management, scientific and technical consulting", covers "Management, consulting services", "Environmental consultants" and "Other scientific consultants" and "Total research and development services" covers "Research and development in physical, engineering and life sciences" and "Research and development in social sciences and humanities". For detailed information on these five-digit level industries, see the CD-ROM entitled *Survey of Innovation 2003: Statistical Tables for Selected Service Industries*, catalogue number 88-524-XCB.

1. What is innovation?

Innovation combines invention and discovery with practical application, either by bringing the invention to the market or to the workplace. The Oslo Manual[8] outlines proposed guidelines for collecting and interpreting innovation data and allows the production of internationally comparable, meaningful indicators of innovation. The manual identifies two types of technological innovation — product innovation and process innovation.

An innovative firm is one that has introduced a new or significantly improved product onto the market or introduced a new or significantly improved process into the production process during the previous three years.

In the case of product innovation, the product must be new to the establishment and it must have been introduced to the market, and not simply be ready for introduction to the market. The term "product" includes both goods and services. Complex products may be innovative as a result of changes to one of the components or subsystems. Changes to a firm's existing products that are purely aesthetic, or that involve only minor modifications, are not considered to be innovations.

A process innovation must have been actually used within the production process. New or significantly improved processes are those that are new to the firm. The outcome of process innovation should be significant with respect to the level of output, quality of products (goods or services) or costs of production and distribution. Minor or routine changes to processes are not to be included. The term "process" also includes improved ways of delivering goods or services.

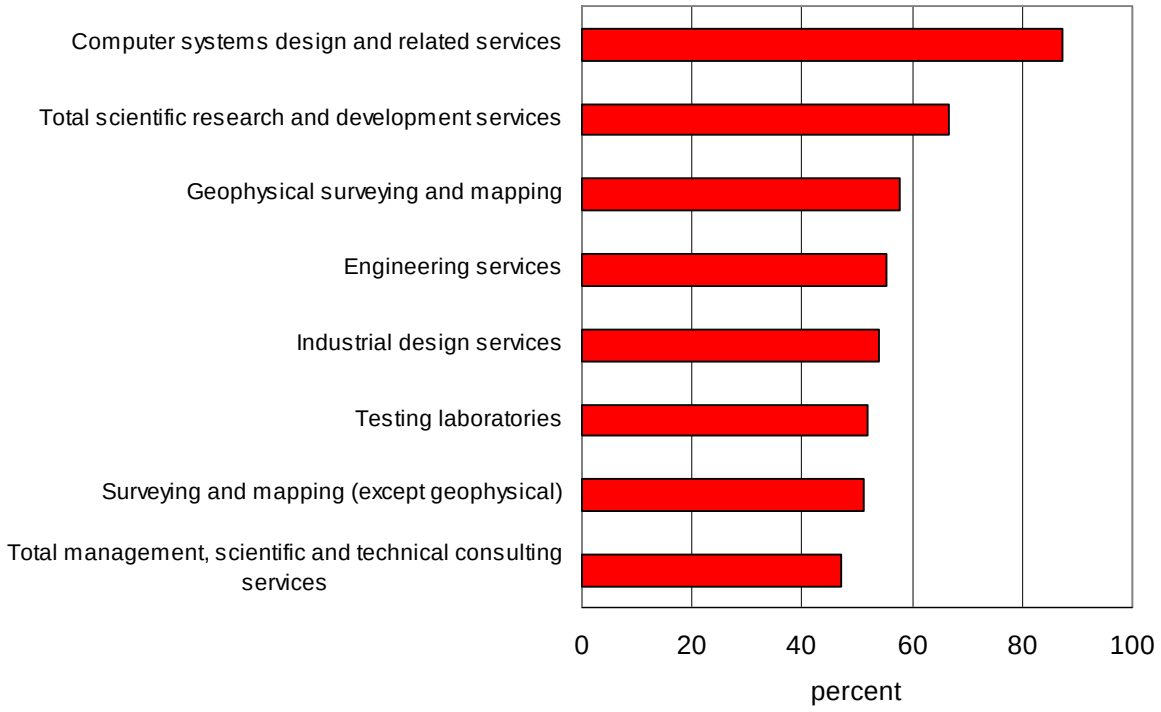
This section will look at the percentage of innovators, the type of innovation being undertaken and the degree of novelty of innovations in selected professional, scientific and technical industries.

8. OECD/Eurostat (1997), *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (Oslo Manual)*. Paris: OECD.

Rates of innovation

A minimum of almost half of all establishments in each of the selected professional, scientific and technical services industries were innovative (Figure 1). “Computer systems design and related services” reported the highest percentage of innovators, with 87% of establishments indicating that they had introduced a new or significantly improved product or process. “Total management, scientific and technical consulting services” establishments reported the lowest proportion of innovators amongst selected professional, scientific and technical service industries with 47% reporting they had introduced a new or significantly improved product or process. This was the only one of the selected professional, scientific and technical services industries in which fewer than one half of establishments were innovative.

Figure 1
Percentage of innovative establishments, 2001 to 2003

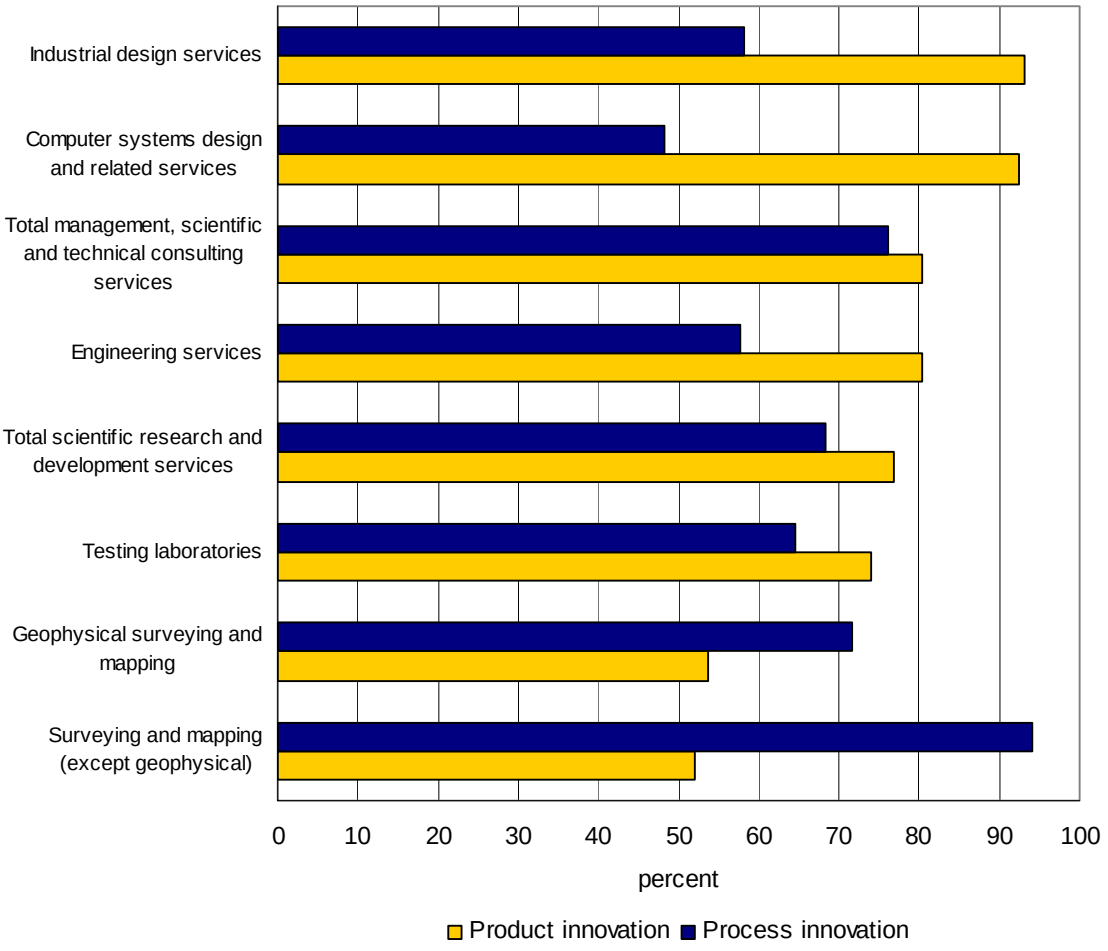


Source: *Appendix II, table 1A*

Type of innovation

Propensity to engage in product vs. process innovation varies amongst the various selected professional, scientific and technical services (Figure 2). Generally, product innovation was more frequently reported than process innovation. The exceptions were the two geographical surveying and mapping industries, which reported higher propensity to engage in process innovation. Innovative establishments in "Industrial design services" reported the highest propensity to engage in product innovation, at 93%, while "Surveying and mapping (except geophysical)" reported the highest propensity of process innovation, at 94%.

Figure 2
Percentage of innovative establishments engaged in product and process innovation amongst innovative establishments, 2001 to 2003



Source: *Appendix II, table 2A*

When examined in terms of the three types of innovators (product only, process only or both product and process), there was considerable variation by industry (Table 2).

Amongst selected professional, scientific and technical services industries, generally the largest proportion of innovators was product *and* process innovators, rather than either product only or process only innovators. The exceptions were "Engineering services" and "Computer systems design services", which reported higher proportions of product only innovators; by contrast, the two surveying industries, "Geophysical surveying and mapping" and "Surveying and mapping (except geophysical)", were more likely to report process only innovations.

Table 2: Percentage of innovative establishments with products only, process only and both product and process innovations among innovative establishments, 2001 to 2003

Industry	Both product and process innovators	Product innovators	Process innovators
	%	%	%
Engineering services	38	42	20
Geophysical surveying and mapping	25	28	46
Surveying and mapping (except geophysical)	46	6	48
Testing laboratories	39	35	26
Industrial design services	51	42	7
Computer systems design and related services	41	52	8
Total management, scientific and technical consulting services	27	11	9
Total scientific research and development services	30	21	15

Note: Shading indicates the highest percentage for each industry.
Source: *Appendix II, table 2A*

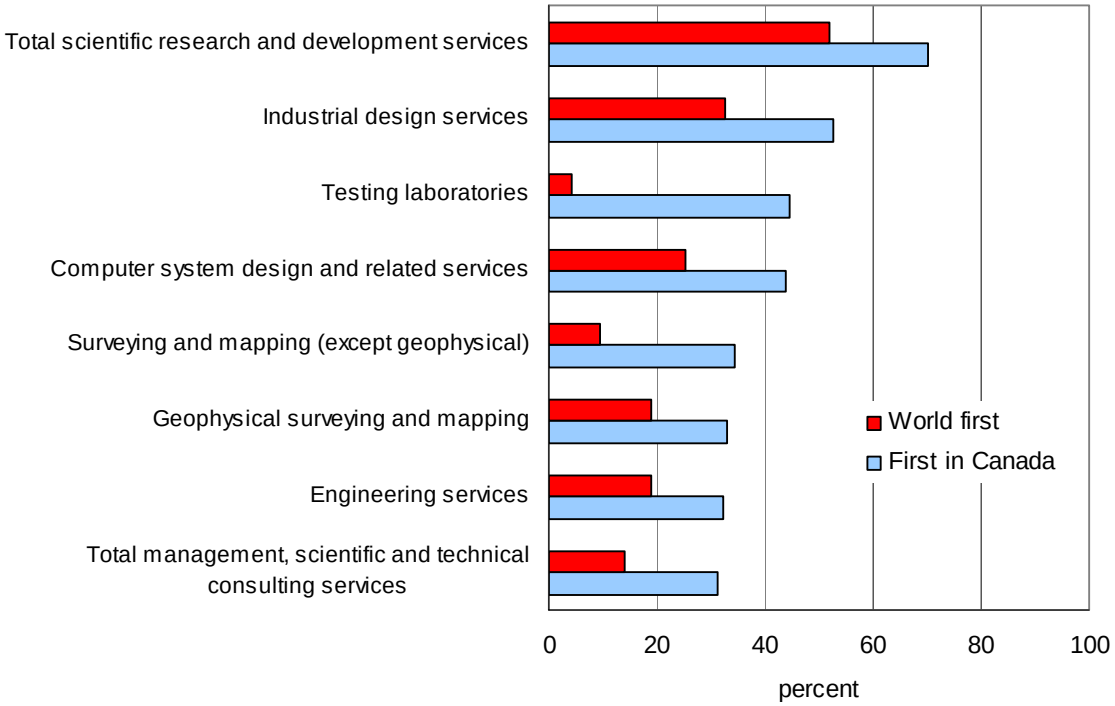
Novelty of innovation

At least three in ten of all innovators in selected professional, scientific and technical services industries reported a Canada-first innovation (Figure 3).

Innovative establishments in "Total scientific R&D services" reported the greatest percentage of first in Canada innovations at 70%, followed by innovative establishments in "Industrial design services" (53%) and "Testing laboratories" (45%).

Over one half of all innovative establishments in "Total scientific R&D services" reported having a world first innovation, product or process, in the period 2001 to 2003. More than one in five establishments in "Industrial design services" and "Computer systems design" also reported a world-first innovation.

Figure 3
Percentage of innovative establishments reporting Canada first or world first, new or significantly improved products (goods or services) and/or processes, 2001 to 2003



Source: *Appendix II, table 3A*

2. How does innovation take place?

This section examines how innovation takes place. It looks at four aspects of innovation: sources of information, innovation activities, who develops innovations and the propensity to engage in cooperative and collaborative arrangements in order to develop innovation.

Sources of information needed for suggesting or contributing to the development of new or significantly improved products or processes may be located within the firm or outside it. The sources outside may arise from working relationships of the firm with its clients, suppliers, consultants, various laboratories and so on. Finally, the information may be generally available to the public.

Innovation can involve a broad range of activities, including engaging in R&D inside the firm, obtaining R&D performed outside the firm, acquisition of equipment and machinery as well as training and market introduction of innovative products.

Innovations can be developed mainly from within the establishment (including the firm the establishment is part of), they can be developed in co-operation with other firms or organizations or they can be developed mainly by other firms or organizations.

Establishments may choose to engage in cooperative or collaborative arrangements to innovate. These arrangements involve the active participation in joint projects between the establishment and other firm and organizations in order to develop new or significantly improved products or processes. Pure contracting out of work, where there is no active collaboration, is not regarded as co-operation.

Sources of information for innovation

Establishments were asked to indicate which sources of information played an important role needed for suggesting or contributing to the development of innovations during the period 2001 to 2003 (Tables 3, 4, 5). For five of eight of the selected professional, scientific and technical industries, establishments indicated that management staff was the most important source out of all of the sources of information for innovation.

There were five key sources of information contributing to innovation for establishments in selected professional, scientific and technical services. Key sources of information were defined as those sources of information which were identified by a majority of establishments as being moderately high or high in importance, in six or more of the 11 selected industries. The key sources of information contributing to innovation for selected professional, scientific and technical industries were: research and development staff; management staff; clients or customers; professional conferences, meeting and journals; and the Internet.

Two internal sources of information were most frequently indicated as important sources of information on innovation for establishments in professional, scientific and technical services industries: management staff, and research and development staff (Table 3).

Table 3: Percentage of innovative establishments indicating that the internal source of information played an important[9] role suggesting or contributing to the development of innovations, 2001 to 2003

Industry	Research and development staff	Marketing staff	Production staff	Management staff	Other business units in firm
	%	%	%	%	%
Engineering services	31	33	41	67*	8
Geophysical surveying and mapping	37	41	37	69*	29
Surveying and mapping (except geophysical)	44	32	52	68	18
Testing laboratories	36	50	31	56	15
Industrial design services	87*	50	34	80	30
Computer system design and related services	71	53	37	58	16
Total management, scientific and technical consulting services	33	32	37	68	19
Total research and development services	88*	45	25	56	19

Note: The overall most frequently indicated source for each industry is indicated with an asterisk, while the most frequently indicated source by category - internal, external and general - is highlighted.

Source: *Appendix II, table 4A*

9. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Clients or customers were the most frequently identified as important amongst external sources of information for innovation across all professional, scientific and technical services industries (Table 4).

Table 4: Percentage of innovative establishments indicating that the external sources of information played an important role suggesting or contributing to the development of innovations, 2001 to 2003

Industry	Suppliers of software, hardware, materials, or equipment	Clients or customers	Consultancy firms	Competitors and other enterprises from same industry	Universities or other higher education institutes
	%	%	%	%	%
Engineering services	45	66	11	34	9
Geophysical surveying and mapping	49	67	28	13	9
Surveying and mapping (except geophysical)	45	57	28	9	21
Testing laboratories	51	69	14	23	7
Industrial design services	67	83	30	62	23
Computer system design and related services	38	88*	10	29	4
Total management, scientific and technical consulting services	46	75*	17	26	15
Total research and development services	34	71	18	33	46

Note: The three external sources with the lowest frequency of selection have been excluded from this table. Federal and provincial/territorial laboratories and private non-profit laboratories are included in Appendix II, Table 5A.
Source: *Appendix II, table 5A*

Innovative establishments in professional, scientific and technical services reported that professional conferences, meetings and journals, and the Internet were important generally available sources of information suggesting or contributing to their development of innovations (Table 5).

Table 5: Percentage of innovative establishments indicating that the generally available sources of information played an important role suggesting or contributing to the development of innovations, 2001 to 2003

	Professional conferences, meetings, journals	Trade fairs and exhibitions	Trade associations	Internet
Industry	**%**	**%**	**%**	**%**
Engineering services	56	30	24	51
Geophysical surveying and mapping	47	31	38	50
Surveying and mapping (except geophysical)	70*	38	24	56
Testing laboratories	74*	40	34	49
Industrial design services	71	71	44	76
Computer system design and related services	43	38	27	64
Total management, scientific and technical consulting services	57	39	34	51
Total research and development services	65	39	32	62

Note: The overall most frequently indicated source for each industry is indicated with an asterisk, while the most frequently indicated source by category - internal, external and general - is highlighted.
Source: *Appendix II, table 6A*

Innovation activities

Innovative establishments were asked to indicate their participation in a series of six innovation activities. The most frequently indicated innovation activity amongst innovative firms in selected professional, scientific and technical services varied by industry but fell into one of four categories: internal R&D; acquisition of equipment and machinery; training; and market introduction of innovations (Table 6).

Table 6: Percent of innovative establishments engaged in activities linked to product or process innovation, 2001 to 2003

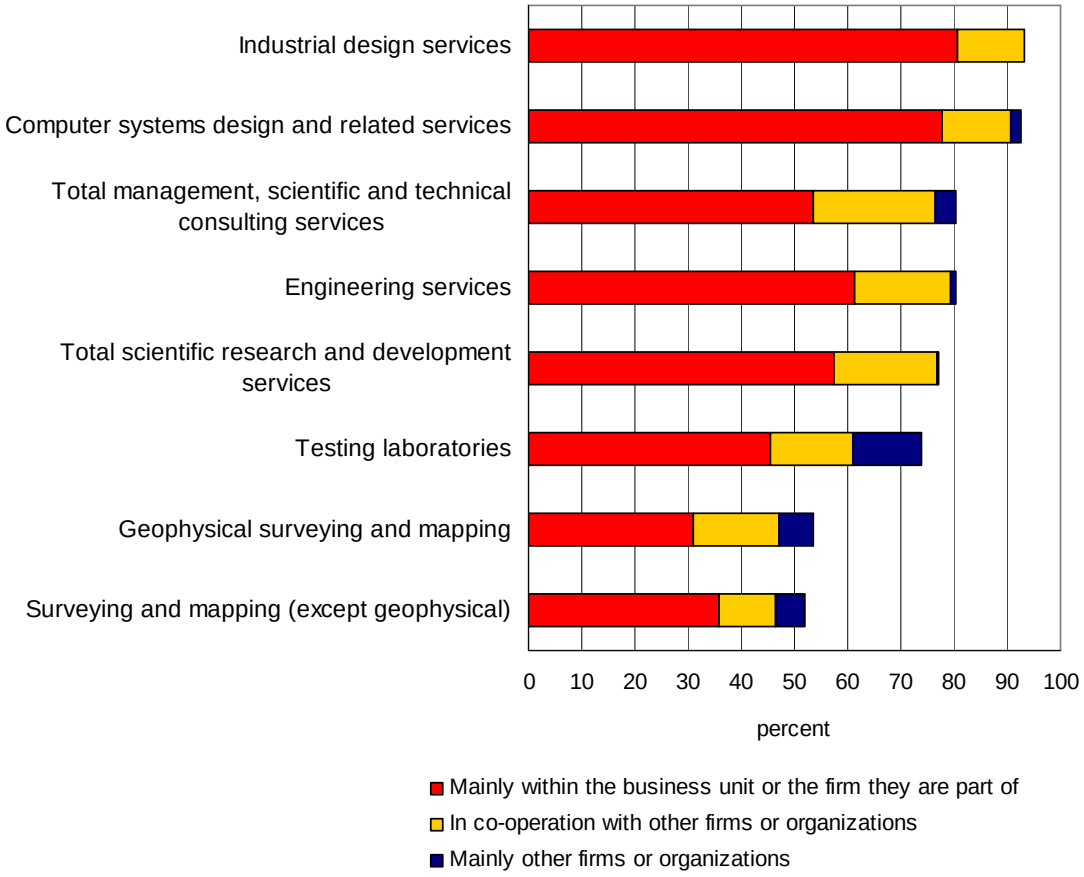
Industry	Internal research and development	External research and development	Acquisition of equipment and machinery	Acquisition of other external knowledge	Training	Market introduction of innovations
	%	%	%	%	%	%
Engineering services	75	28	56	46	83*	70
Geophysical surveying and mapping	66	37	71	53	75*	62
Surveying and mapping (except geophysical)	62	19	85*	48	85*	53
Testing laboratories	76	42	82*	34	68	57
Industrial design services	93*	36	80	44	62	87
Computer systems design and related services	91*	23	73	39	75	79
Total management, scientific and technical consulting services	73	39	63	42	85*	65
Total scientific research and development services	97*	63	72	53	77	77

Note: The two most frequently indicated innovation activity are highlighted in grey for each industry and the most frequently selected is indicated with an asterisk.
Source: *Appendix II, table 7A*

Where innovations are developed

In all selected professional, scientific and technical services industries, innovative establishments were more likely to report that innovative products were developed within the business unit as opposed to developing them in co-operation with other firms or mainly by other firms or organizations (Figure 4).

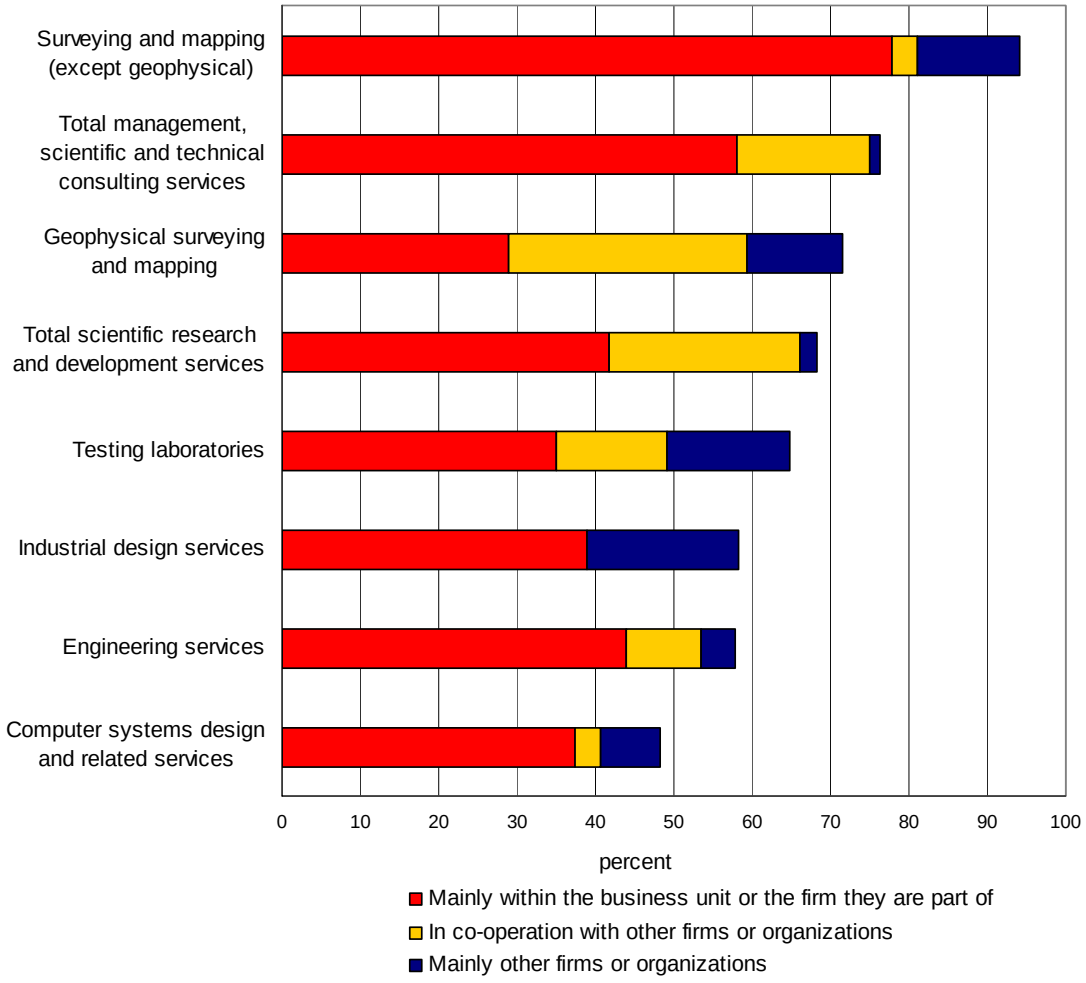
Figure 4
Percent of all innovative establishments indicating who developed their product innovations that were introduced, 2001 to 2003



Source: *Appendix II, table 8A*

Amongst the selected professional, scientific and technical services industries, the tendency to develop process innovations within the business unit or the firm they are part of was also pronounced. In all but one of the selected professional, scientific and technical services industries, process innovations were most likely to be developed within the business unit (Figure 5). Only "Geophysical surveying and mapping" reported essentially equal proportions of innovative establishments developing innovations in co-operation with other firms or organizations and within the business unit. Only this industry reported more than one quarter of innovative establishments having developed innovative processes in cooperation with other firms or organizations.

Figure 5
Percent of all innovative establishments indicating who developed their process innovations that were introduced, 2001 to 2003

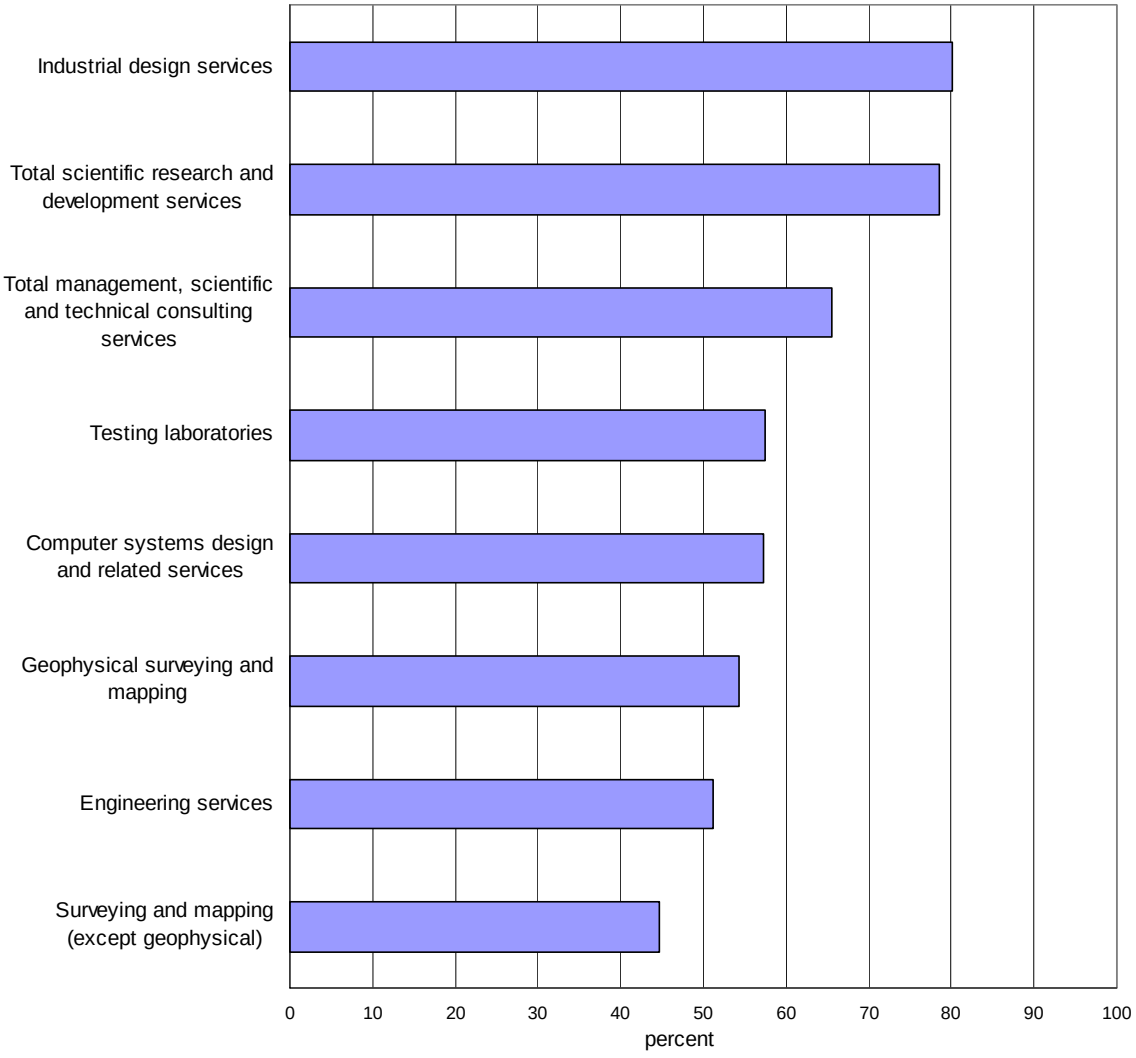


Source: *Appendix II, table 9A*

Innovation collaboration

Even though innovative establishments developed innovative products and processes mainly within their business unit, a majority of innovative establishments reported that they engaged in cooperative and collaborative arrangements with other firms or organizations, except in "Geophysical surveying and mapping (except geophysical)" (Figure 6).

Figure 6
Percent of innovative establishments involved in cooperative and collaborative arrangements to develop new or significantly improved products and processes, 2001 to 2003



Source: *Appendix II, table 10A*

The most frequently indicated reason for engaging in cooperative and collaborative arrangements with other firms or organizations was to access critical expertise, indicated as one of the top two reasons for all selected industries and the top reason by innovative establishments in five of eight industries (Table 7). This was followed by sharing costs. Other frequently indicated reasons included accessing R&D and accessing new markets.

Table 7: Percentage of innovative establishments involved in cooperative and collaborative arrangements indicating reasons[10] for collaboration, 2001 to 2003

	Sharing costs	Accessing research and development	Accessing critical expertise	Accessing new markets
Industry	**%**	**%**	**%**	**%**
Engineering services	63*	34	60	58
Geophysical surveying and mapping	56	30	67*	37
Surveying and mapping (except geophysical)	86*	62	75	75
Testing laboratories	70	39	71*	28
Industrial design services	54	59	62*	57
Computer systems design and related services	63	40	69*	54
Total management, scientific and technical consulting services	51	41	52	70*
Total scientific research and development services	57	69	76*	32

Note: The two frequently indicated innovation activities are highlighted in grey for each industry and the most frequently selected by industry is indicated with an asterisk.
Source: *Appendix II, table 11A*

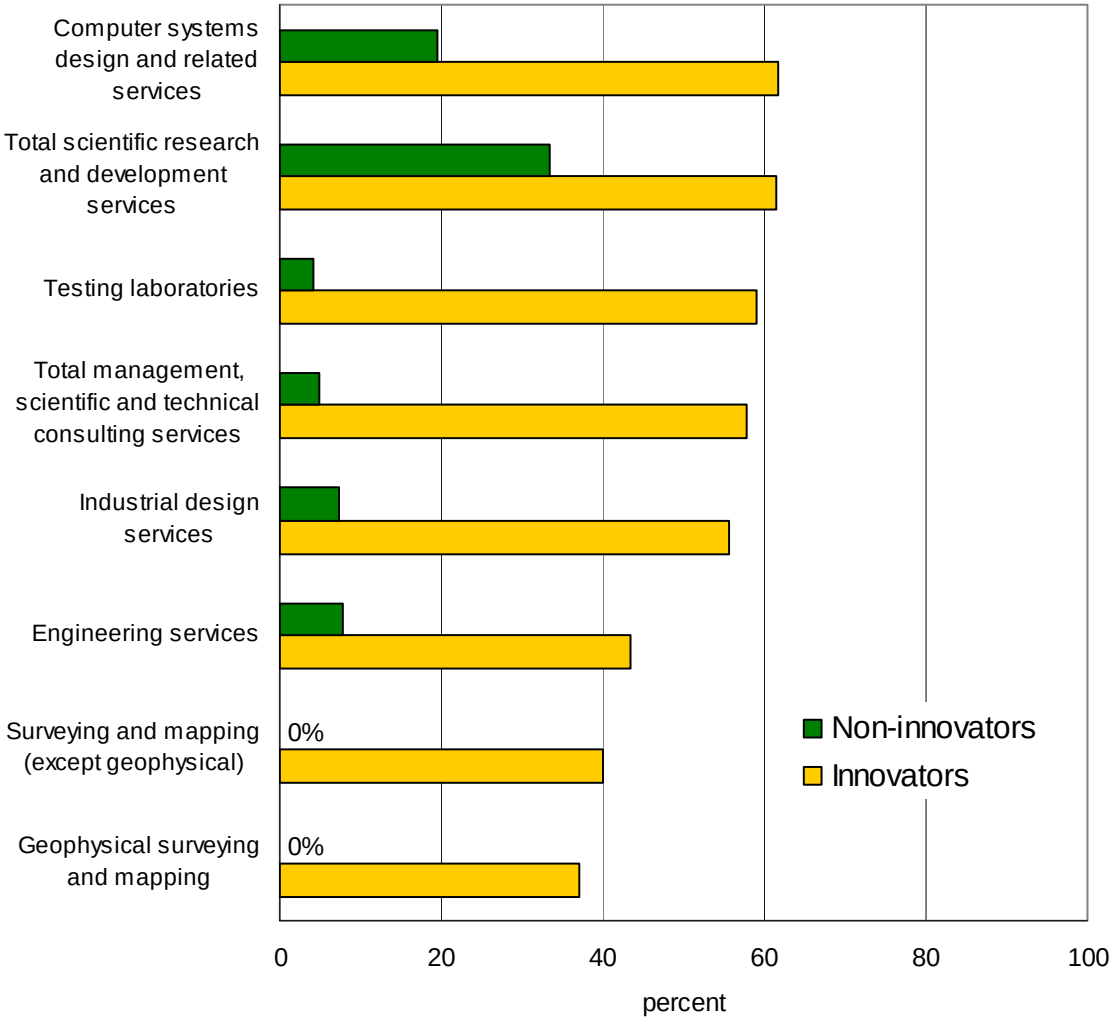
10. Establishments were asked to consider a list of eight reasons and to identify all those that applied. Further details are available in Table 11A in Appendix II.

Not yet completed or abandoned innovation activities

Some establishments may attempt innovation but not complete the process of bringing the product to market or the process to the factory. The attempted innovation may be abandoned or not yet completed.

The percentages of innovative establishments that indicated not yet complete or abandoned innovations ranged widely by industry, from 62% of innovative establishments in "Computer systems design and related services" to 37% of innovative establishments in "Geophysical surveying and mapping" (Figure 7). By contrast, far fewer non-innovative establishments in each of the selected professional, scientific and technical services industries indicated that they had attempted to undertake innovation projects.

Figure 7
Percentage of establishments with unsuccessful or not yet completed projects to develop or introduce new or significantly improved products or processes, 2001 to 2003



Source: *Appendix II, table 12A*

3. What are the obstacles to innovation and the support programs for innovation?

This section will examine the problems and obstacles faced by firms who engage in innovative activities. Engaging in innovation activities requires the allocation of resources, both human and financial, by the establishment. Obstacles to innovation can include a lack of such resources and perceived risk with respect to feasibility or market success.

Federal and provincial governments provide a variety of support programs to promote innovation activities. These support programs are intended to help overcome some of the obstacles to innovation, such as the perceived risks of innovation, the difficulty in finding trained staff to undertake innovation activities and the costs involved in innovation activities.

Problems and obstacles to innovation

Establishments were asked to indicate the importance of problems or obstacles which slowed down or caused problems during the development of innovations during the period 2001 to 2003 (Tables 7, 8 and 9). Amongst the three categories of factors, economic factors were indicated by the highest percentage of innovative establishments as important problems and obstacles.

Economic factors

The factor identified as the most important amongst the economic factors varied by industry (Table 8). Risks related to feasibility were the most frequently indicated by "Engineering services"; risks in terms of the innovation's market success was indicated by "Surveying and mapping (except geophysical)", "Computer systems design" and "Total research and development services"; costs of innovation was the most frequently indicated by "Geophysical surveying and mapping", "Testing laboratories" and "Industrial design services"; while the lack of appropriate sources of finance was indicated most frequently by "Total management, scientific and technical services".

Table 8: Percentage of innovative establishments indicating economic factors were important[11] problems and obstacles that slowed down or caused problems when developing innovations, 2001 to 2003

	Risk related to the feasibility of innovative projects	Risk in terms of innovation's market success	Innovation costs too high	Lack of appropriate sources of finance
	%	%	%	%
Engineering services	47*	42	33	25
Geophysical surveying and mapping	33	25	37*	29
Surveying and mapping (except geophysical)	29	43*	27	9
Testing laboratories	49	44	55*	38
Industrial design services	72	66	76*	39
Computer systems design and related services	36	56*	43	39
Total management, scientific and technical services	22	28	34	38
Total research and development services	54	55*	41	47

Note: The overall most frequently indicated obstacle or problem for each industry is indicated with an asterisk, while the most frequently indicated problem or obstacle by category - economic, internal and other - is highlighted in each table.
Source: *Appendix II, table 13A*

11. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Internal factors

Internal factors were generally less frequently indicated than economic factors. Amongst the five internal factors, the inability to devote staff on an on-going basis due to production requirements was the most frequently indicated as an important obstacle to innovation (Table 9). "Total research and development services" was the only industry amongst the selected professional, scientific and technical services to report another internal factor as being important more often. Their most frequently indicated internal obstacle was a lack of information about market.

Table 9: Percentage of innovative establishments indicating internal factors were important[12] problems and obstacles that slowed down or caused problems when developing innovations, 2001 to 2003

	Organizational rigidities within the enterprise	Inability to devote staff on on-going basis due to production requirements	Lack of qualified personnel	Lack of information on technology	Lack of information on markets
	%	%	%	%	%
Engineering services	10	47*	22	9	16
Geophysical surveying and mapping	10	37*	33	2	8
Surveying and mapping (except geophysical)	27	38	17	15	12
Testing laboratories	14	45	37	18	21
Industrial design services	0	37	13	19	26
Computer systems design and related services	11	36	10	5	23
Total management, scientific and technical services	10	42*	13	1	11
Total research and development services	10	27	10	8	33

Note: The overall most frequently indicated obstacle or problem for each industry is indicated with an asterisk, while the most frequently indicated problem or obstacle by category - economic, internal and other - is highlighted in each table.
Source: *Appendix II, table 14A*

12. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Other factors

"Other factors" (Table 10) were less frequently indicated as important obstacles to innovation. Amongst the four factors specified, a lack of customer responsiveness to new goods or services was the most frequently identified as an important obstacle to innovation by all but one of the selected professional, scientific and technical services industries. Insufficient flexibility of regulations or standards was the most frequently indicated by establishments in "Surveying and mapping (except geophysical)".

Table 10: Percentage of innovative establishments indicating other factors were important[13] problems and obstacles that slowed down or caused problems when developing innovations, 2001 to 2003

	Insufficient flexibility of regulations or standards	Lack of customer responsiveness to new goods or services	Lack of industry-wide standards	Lack of regulations in e-commerce as obstacle to exporting innovative products
	%	%	%	%
Engineering services	11	25	16	0
Geophysical surveying and mapping	11	25	12	0
Surveying and mapping (except geophysical)	18	13	9	0
Testing laboratories	34	42	24	5
Industrial design services	12	39	0	0
Computer systems design and related services	3	22	12	2
Total management, scientific and technical services	3	23	8	1
Total research and development services	28	30	8	5

Note: The overall most frequently indicated obstacle or problem for each industry is indicated with an asterisk, while the most frequently indicated problem or obstacle by category - economic, internal and other - is highlighted in each table.
Source: *Appendix II, table 15A*

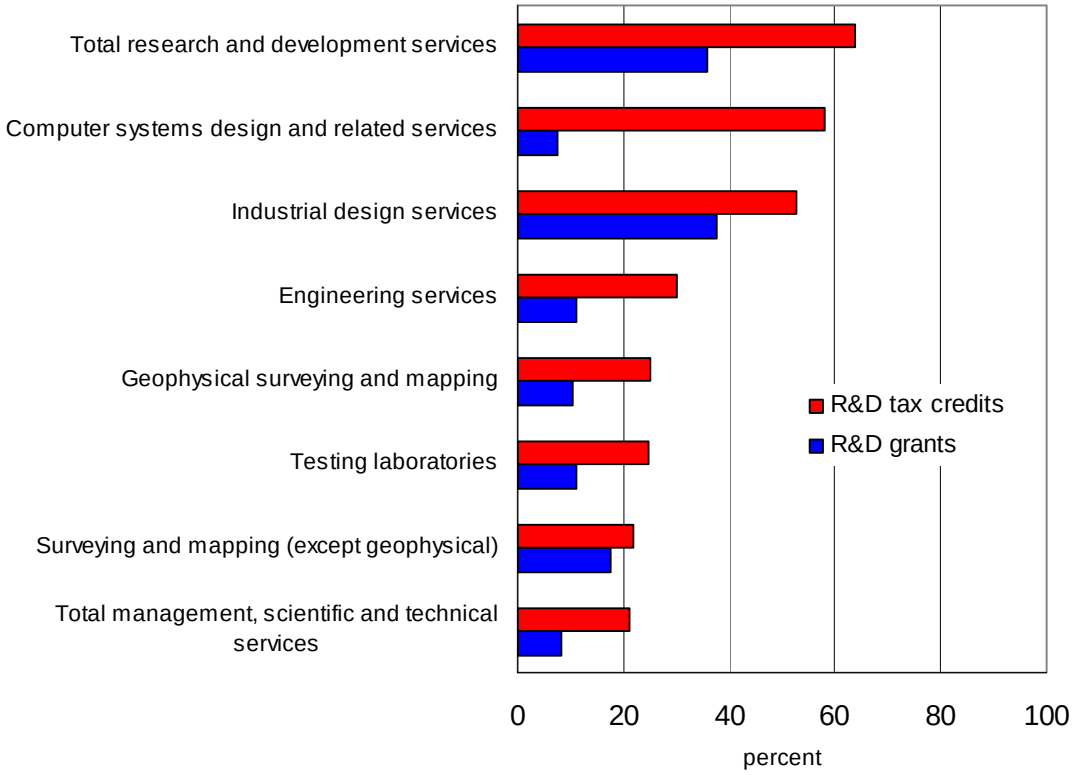
13. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

Government support programs

Innovative establishments were asked to indicate their use of a variety of six government support programs: R&D tax credits, R&D grant, government venture capital support, government technology support and assistance, government information or Internet services and government support for training. R&D tax credits was either the most frequently used or the second most frequently used (after government information and Internet services) for innovative establishments in all selected professional, scientific and technical services industries.

"Total research and development services" reported the highest rate of use of government R&D tax credit programs (64%), while "Total management, scientific and technical services" reported the lowest (21%) (Figure 8). R&D grants, by contrast, were less frequently reported in all professional, scientific and technical services industries.

Figure 8
Percentage of innovative establishments indicating that they used government R&D tax credits or R&D grants, 2001 to 2003



Source: *Appendix II, table 16A*

Amongst the other government support programs, the most commonly used were government information or internet services for six of seven selected professional, scientific and technical services industries and government support for training for "Testing laboratories" (Table 11).

Table 11: Percentage of innovative establishments[14] indicating use of other government support programs, 2001 to 2003

	Government venture capital support	Government technology support and assistance programs	Government information or internet services	Government support for training
	%	%	%	%
Engineering services	6	11	47	13
Geophysical surveying and mapping	0	2	18	14
Surveying and mapping (except geophysical)	0	11	33	5
Testing laboratories	0	8	23	35
Computer systems design and related services	2	10	25	13
Total management, scientific and technical services	1	6	41	16
Total research and development services	16	25	32	29

Note: The most frequently indicated government support program is highlighted for each industry.
Source: *Appendix II, table 16A*

14. "Industrial design services" was not included due to the absence of reliable data.

4. What are the impacts of innovation?

This section will examine the impacts of innovation. Firms were asked to indicate the importance of 10 possible impacts of innovation. Impacts of innovation varied by industry but four impacts were more frequently indicated than the others (they were either the most frequently or second most frequently indicated impacts).

Amongst these four impacts, allowing business unit to keep up with its competitors and improved quality of products (goods or services) were either the first of second most frequent selection by at least five of the selected professional, scientific and technical services industries (Table 12). The other two important impacts that were selected by innovative establishments in several industries were increased productivity and increased ability to adapt flexibly to different client demands.

Table 12: Percentage of innovative establishments that indicated an impact[15] resulting from the development and introduction of innovations, 2001 to 2003

	Increased the business unit's productivity	Increased the ability to adapt flexibly to different client demands	Allowed business unit to keep up with its competitors	Improved the quality of products (goods or services)
	%	%	%	%
Engineering services	47	59	59	60*
Geophysical surveying and mapping	66	59	69*	65
Surveying and mapping (except geophysical)	60	51	61*	58
Testing laboratories	45	54	65*	60
Industrial design services	73	93*	80	90
Computer systems design and related services	46	68*	61	56
Total management, scientific and technical services	61	63	73*	73*
Total research and development services	53	52	60	73*

Note: The two most frequently indicated result of innovation have been highlighted for each industry and the most frequently selected is indicated with an asterisk.
Source: *Appendix II, table 17A*

15. Establishments were asked whether or not they agreed with statements describing impacts of innovation. "Agree" indicates that they responded by selecting "4" or "5", while "Strongly agree" indicates that they selected "5" and "Not relevant" indicates that they selected "0".

5. Why do some establishments choose not to innovate?

Lack of market demand was the most frequently indicated reason for not developing new or significantly improved products (goods or services) or processes for industries where reliable data are available for each reason (Table 13). Lack of perceived market demand was the only reason to be indicated by more than half of all non-innovators in all of the selected professional, scientific and technical services industry for which reliable data are available.

Table 13: Percentage of non-innovative establishments[16] indicating reason for not developing new or significantly improved products (goods or services) or processes, 2001 to 2003

Selected professional, scientific and technical services	Carried out prior to 2001-2003	No market demand	Lack of funds	Lack of trained staff
	%	%	%	%
Engineering services	26	76	28	29
Surveying and mapping (except geophysical)	40	75	27	17
Testing laboratories	28	64	41	10
Total management, scientific and technical consulting services	34	58	18	12
Total scientific research and development services	25	30	24	21

Note: The most frequently indicated reason for not developing new or significantly improved products or processes is highlighted.
Source: *Appendix II, table 18A*

16. Note "Computer systems design and related services", "Industrial design services" and "Geophysical surveying and mapping" were not included due to the absence of reliable data.

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Baldwin, John, Guy Gellatly, Joanne Johnson and Valerie Peters (1998), *Innovation in Dynamic Service Industries*, Statistics Canada, Catalogue No. 88-516-XPB

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OECD/Eurostat (1997), *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (Oslo Manual)*, Paris: OECD.

Statistics Canada (2003), *North American Industry Classification System: Canada 2002*, Catalogue no. 12-501-XPE. Ottawa: Statistics Canada.

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Statistics Canada (2005), *Survey of Innovation 2003: Statistical Tables for Selected Service Industries*, Catalogue No. 88-524-XCB. Ottawa: Statistics Canada.

Appendix I: Description of the selected Professional, Scientific and Technical Services industries

All establishments and enterprises in Canada are defined according to a classification system called the North American Industry Classification System (NAICS)[17]. This standard was revised in 2002, and it is this revised version which was used for the Survey of Innovation 2003.

NAICS 54133 - Engineering Services – This industry comprises establishments primarily engaged in applying principles of engineering in the design, development and utilization of machines, materials, instruments, structures, processes and systems. The assignments undertaken by these establishments may involve any of the following activities: the provision of advice, the preparation of feasibility studies, the preparation of preliminary and final plans and designs, the provision of technical services during the construction or installation phase, the inspection and evaluation of engineering projects, and related services. Exclusions consist of establishments primarily engaged in both the design and construction of buildings, highways and other structures (23, Construction); managing construction projects (236,237); gathering, interpreting and mapping geophysical data (54136, Geophysical Surveying and Mapping Services); providing engineering surveying services (54137, Surveying and Mapping (except Geophysical) Services); creating and developing designs and specifications that optimize the function, value and appearance of products (54142, Industrial Design Services); planning and designing computer systems that integrate existing hardware, packaged or custom software and communication technologies (54151, Computer Systems Design and Related Services); and providing advice and assistance to others on environmental issues, such as the control of environmental contamination from pollutants, toxic substances and hazardous materials (54162, Environmental Consulting Services).

NAICS 54136 - Geophysical surveying and mapping - This Canadian industry comprises establishments primarily engaged in gathering, interpreting and mapping geophysical data. These establishments often specialize in locating and measuring the extent of subsurface resources, such as oil, gas and minerals, but they may also conduct surveys for engineering purposes. A variety of surveying techniques are used, including seismic, magnetic, gravity, electrical and electromagnetic, radioactive and remote sensing, depending on the purpose of the survey. Examples of activities which would be covered by this industry classification include: Electrical geophysical surveying services; Electromagnetic geophysical surveying services; Geological surveying services; Geophysical surveying for non-metallic minerals, services; Gravimetric surveying services, geophysical; Oceanic surveying, geophysical; Oil gas field seismographic surveys; Seismic drilling; Seismic geophysical surveying services.

NAICS 54137 - Surveying and mapping (except geophysical) - This Canadian industry comprises establishments primarily engaged in providing surveying and mapping services of the surface of the earth, including the sea floor. These services may include surveying and mapping of areas above or below the surface of the earth, such as the creation of view easements or segregating rights in parcels of land by creating underground utility easements. Examples of activities in this industry are cadastral and topographic surveying and mapping services; control surveying services, such as geodesy and Global Positioning System (GPS) surveying; cartographic surveying services, including photogrammetric mapping; geographic information system (GIS) base mapping and quality control services; and geospatial mapping services. Examples of activities which would be covered by this industry classification include: Aerial surveying (except geophysical), using specialized equipment; Cadastral surveying services; Cartographic surveying services; Geographic information system (GIS), base mapping services; Geomatic services; Geospatial mapping services; Hydrographic

17. Source: http://www.statcan.ca/english/Subjects/Standard/naics/2002/naics02-menu.htm

mapping services; Land surveying services (except geophysical); Mapmaking (except geophysical) services; Oceanic surveying (except geophysical) services; Photogrammetric mapping services; Production of topographic materials and maps; Surveying services (except geophysical).

NAICS 54138 - Testing laboratories - This industry comprises establishments primarily engaged in providing physical, chemical and other analytical testing services. The testing activities may occur in a laboratory or on-site. Exclusions consist of establishments primarily engaged in performing laboratory testing for the veterinary profession (54194, Veterinary Services); performing clinical laboratory testing for the medical profession (62151, Medical and Diagnostic Laboratories); and auto emissions testing (81119, Other Automotive Repair and Maintenance).

NAICS 54142 – Industrial design services - This industry comprises establishments primarily engaged in creating and developing designs and specifications that optimize the function, value and appearance of products. These services can include the determination of the materials, construction, mechanisms, shape, colour, and surface finishes of the product, taking into consideration human needs, safety, market appeal and efficiency in production, distribution, use and maintenance. Exclusions consist of establishments primarily engaged in designing, subcontracting the manufacturing and marketing of products (31-33, Manufacturing); applying principles of engineering in the design, development and utilization of machines, materials, instruments, structures, processes and systems (54133, Engineering Services); and designing clothing, shoes and jewellery (54149, Other Specialized Design Services).

NAICS 54151 - Computer System Design - This industry comprises establishments primarily engaged in providing expertise in the field of information technologies through one or more activities, such as writing, modifying, testing and supporting software to meet the needs of a particular customer, including the creation of Internet home pages; planning and designing computer systems that integrate hardware, software and communication technologies; on-site management and operation of clients' computer and data processing facilities; providing advice in the field of information technologies; and other professional and technical computer-related services. Exclusions consist of establishments primarily engaged in: retailing computer hardware and software and providing support services (44312, Computer and Software Stores); publishing packaged software (51121, Software Publishers); and providing data processing services (51821, Data Processing, Hosting, and Related Services).

NAICS 54161 - Management Consulting Services - This industry comprises establishments primarily engaged in providing advice and assistance to other organizations on management issues, such as strategic and organizational planning; financial planning and budgeting; marketing objectives and policies; human resource policies, practices and planning; and production scheduling and control planning. Exclusions consist of establishments primarily engaged in: providing office or general administrative services on a day-to-day basis (561110, Office Administrative Services).

NAICS 54162 - Environmental Consultants - This industry comprises establishments primarily engaged in providing advice and assistance to other organizations on environmental issues, such as the control of environmental contamination from pollutants, toxic substances and hazardous materials. These establishments identify problems, measure and evaluate risks, and recommend solutions. They employ a multi-disciplined staff of scientists, engineers and other technicians, with expertise in areas such as air and water quality, asbestos contamination, remediation and environmental law. Examples of establishments in this industry are environmental consultants, sanitation consultants and site remediation consultants. Exclusions consist of establishments primarily engaged in: providing

environmental engineering services (54133, Engineering Services); and environmental remediation (56291, Remediation Services).

NAICS 54169 - Other Scientific and Technical Consulting Services - This industry comprises establishments, not classified to any other industry, primarily engaged in providing advice and assistance to other organizations on scientific and technical issues.

NAICS 54171 - R&D in Physical, Engineering and Life Sciences - This industry comprises establishments primarily engaged in conducting research and experimental development in the physical engineering and life sciences, including electronics, computers, chemistry, oceanography, geology, mathematics, physics, environmental, medicine, health, biology, botany, biotechnology, agriculture, fisheries, forestry, pharmacy, veterinary and other allied subjects. Exclusions consist of establishments primarily engaged in: research and development on aerospace equipment undertaken by establishments belonging to enterprises manufacturing such equipment (33641, Aerospace Product and Parts Manufacturing); physical, chemical or other analytical testing services (54138, Testing Laboratories); performing laboratory testing for the veterinary profession (54194, Veterinary Services); and performing clinical laboratory testing for the medical profession (62151, Medical and Diagnostic Laboratories).

NAICS 54172 - R&D in the Social Sciences and Humanities - This industry comprises establishments primarily engaged in conducting research and analyses in education, sociology, psychology, language, economics, law, and other social sciences and humanities. Exclusions consist of establishments primarily engaged in marketing research (54191, Marketing Research and Public Opinion Polling).

Appendix II: Detailed data tables

The reliability of the data is reported using the following symbol convention (Tables A and B) for quality indicator interpretation. This convention combines the effect of sampling and the imputation rate.

Quality Indicators

Table A: Coefficient of Variation

	Imputation Rate			
CV	**< 15%**	**≥ 15% and < 35%**	**≥ 35% and < 50%**	**≥ 50%**
≤ 5.0%	A	B	E	F
> 5.0% and ≤ 15%	B	E	F	F
> 15.0% and ≤ 30.0%	E	F	F	F
> 30.0%	F	F	F	F

Table B: Standard Error

	Imputation Rate			
Standard Error	**< 15%**	**≥ 15% and < 35%**	**≥ 35% and < 50%**	**≥ 50%**
≤2.5%	A	B	E	F
>2.5% and ≤7.5%	B	E	F	F
>7.5 and ≤15%	E	F	F	F
>15%	F	F	F	F

Estimates with a quality indicator of A are very reliable.
Estimates with a quality indicator of B are reliable.
Estimates with a quality indicator of E are to be used with caution.
Estimates with a quality indicator of F have very poor reliability and have been suppressed.

Measures of importance and agreement

For Tables 4, 5, 6, 13, 14 and 15, establishments were asked to indicate the importance of various factors in question, be it sources of information, problems and obstacles, etc. Respondents were asked to indicate the importance using a scale of 1 to 5, where 1 is low importance and 5 is high importance. "Important" in the descriptive text portion of this document indicates a response of "4" or "5". In the tables that follow, "High" indicates a response of "5" and "Moderately high" indicates a response of "4". Respondents could also indicate "0", which indicated the factor was not relevant.

For Table 17, establishments were asked whether or not they agreed with statements describing impacts of innovation. "Agree" indicates that they responded by selecting "4" or "5", while "Strongly agree" indicates that they selected "5" and "Not relevant" indicates that they selected "0".

Statistical Unit

The questionnaire was directed to establishments. "The establishment is the level at which the accounting data required to measure production is available (principal inputs, revenues, salaries and wages). The establishment, as a statistical unit, is defined as the most

homogeneous unit of production for which the business maintains accounting records from which it is possible to assemble all the data elements required to compile the full structure of the gross value of production (total sales or shipments, and inventories), the cost of materials and services, and labour and capital used in production."[18] In the questionnaire, establishments were referred to as "business units" as this terminology was found to be more familiar to respondents completing the survey. Establishments were also asked whether or not they belonged to larger firms, which corresponds to the statistical concept of the enterprise.

Note: A complete set of tables, comprising over one thousand tables presenting the results of the Survey of Innovation, 2003, for Canada and all provinces and territories is available on a CD-ROM entitled *Survey of Innovation 2003: Statistical Tables for Selected Service Industries,* catalogue number 88-524-XCB.

18. Source: http://www.statcan.ca/english/concepts/stat-unit-def.htm

Table 1A: Percentage of innovative establishments, 2001 to 2003

	Innovators	
	%	Reliability
Engineering services	47.4	B
Geophysical surveying and mapping	31.1	E
Surveying and mapping (except geophysical)	24.9	E
Testing laboratories	24.0	E
Industrial design services	32.7	E
Computer systems design and related services	61.1	E
Total management, scientific and technical consulting services	47.1	B
Total scientific research and development services	66.6	B

Table 2A: Percentage of types of innovative establishments, 2001 to 2003

	Innovators		Product innovators		Process innovators	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	100.0	A	80.4	B	57.8	B
Geophysical surveying and mapping	100.0	A	53.7	E	71.6	E
Surveying and mapping (except geophysical)	100.0	A	51.9	B	94.2	B
Testing laboratories	100.0	A	74.0	B	64.6	B
Industrial design services	100.0	A	93.2	B	58.2	B
Computer systems design and related services	100.0	A	92.4	A	48.2	B
Total management, scientific and technical consulting services	100.0	A	80.4	B	76.2	B
Total scientific research and development services	100.0	A	76.9	B	68.3	B

Table 2A (con't): Percentage of types of innovative establishments, 2001 to 2003

	Both product and process innovators		Product innovators only		Process innovators only	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	38.1	B	42.2	B	19.6	B
Geophysical surveying and mapping	25.2	B	28.4	E	46.3	E
Surveying and mapping (except geophysical)	46.1	B	5.8	B	48.1	B
Testing laboratories	38.6	B	35.4	B	26.0	B
Industrial design services	51.3	B	41.8	B	6.8	B
Computer systems design and related services	40.6	B	51.8	B	7.6	A
Total management, scientific and technical consulting services	56.6	B	23.8	B	19.6	B
Total scientific research and development services	45.2	B	31.7	B	23.1	B

Table 3A - Novelty of new or significantly improved products (goods or services) and/or processes, developed by innovative establishments, 2001 to 2003

	First in Canada		World first	
	%	Reliability	%	Reliability
Engineering services	32.3	B	19.1	B
Geophysical surveying and mapping	33.0	E	18.9	B
Surveying and mapping (except geophysical)	34.3	B	9.6	B
Testing laboratories	44.7	B	4.2	A
Industrial design services	52.7	B	32.8	B
Computer system design and related services	43.7	B	25.1	B
Total management, scientific and technical consulting services	31.2	B	14.0	B
Total scientific research and development services	70.0	B	52.0	B

Table 4A: Percentage of innovative establishments using internal sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Research and development staff	12.1	B	18.6	B	30.4	B
Marketing staff	23.9	B	8.6	B	22.1	B
Production staff	25.4	B	15.7	B	11.4	B
Management staff	42.8	B	24.5	B	4.0	A
Other business units in firm	5.3	A	2.8	A	56.6	B
Geophysical surveying and mapping						
Research and development staff	16.4	B	20.9	B	28.4	E
Marketing staff	28.4	E	12.1	B	32.7	E
Production staff	20.1	B	16.8	B	30.7	E
Management staff	32.0	E	36.5	E	4.7	A
Other business units in firm	12.1	B	16.4	B	47.0	E
Surveying and mapping (except geophysical)						
Research and development staff	19.3	B	25.0	B	11.1	B
Marketing staff	28.5	B	3.2	A	14.1	B
Production staff	22.8	B	29.4	B	6.4	B
Management staff	32.7	B	35.1	B	3.8	B
Other business units in firm	7.0	B	11.4	B	60.7	B
Testing laboratories						
Research and development staff	24.2	B	11.7	B	7.1	B
Marketing staff	39.0	B	10.5	B	6.4	A
Production staff	24.4	B	6.9	B	8.4	B
Management staff	36.7	B	19.2	B	2.1	A
Other business units in firm	4.8	A	10.1	B	25.2	B
Industrial design services						
Research and development staff	30.8	B	56.2	E	0.0	A
Marketing staff	0.0	A	50.0	E	0.0	A
Production staff	15.2	B	19.2	B	46.5	B
Management staff	24.0	B	56.2	E	0.0	A
Other business units in firm	13.0	B	16.5	B	39.7	E
Computer system design and related services						
Research and development staff	28.6	B	42.5	B	14.3	B
Marketing staff	38.5	B	14.2	B	7.3	A
Production staff	34.4	B	2.2	A	25.6	B
Management staff	29.6	B	27.9	B	4.4	A
Other business units in firm	6.7	A	9.1	B	46.2	B

Table 4A (con't): Percentage of innovative establishments using internal sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Total management, scientific and technical consulting services						
Research and development staff	20.6	B	20.6	B	29.3	B
Marketing staff	20.2	B	20.2	B	26.1	B
Production staff	21	B	21	B	29.2	B
Management staff	26.2	B	26.2	B	2.8	A
Other business units in firm	5.8	A	5.8	A	49.9	B
Total research and development services						
Research and development staff	24.8	B	24.8	B	7.5	A
Marketing staff	23.3	B	23.3	B	12.6	B
Production staff	20.9	B	20.9	B	28.9	B
Management staff	30.6	B	30.6	B	0.3	A
Other business units in firm	6.8	A	6.8	A	49.7	B

Table 5A: Percentage of innovative establishments using external sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Suppliers of software, hardware, materials, or equipment	28.8	B	16.4	B	13.8	B
Clients or customers	35.4	B	30.4	B	4.3	A
Consultancy firms	10.4	B	0.4	A	25.6	B
Competitors and other enterprises from same industry	20.6	B	12.9	B	11.8	B
Universities or other higher education institutes	7.1	A	2.2	A	27.6	B
Federal government research laboratories	6.7	A	0.2	A	46.3	B
Provincial/territorial government research laboratories	4.3	A	0.0	A	48.5	B
Private non-profit research laboratories	0.0	A	0.0	A	57.0	B
Geophysical surveying and mapping						
Suppliers of software, hardware, materials, or equipment	16.5	B	32.7	E	20.8	B
Clients or customers	22.1	B	45.2	E	14.3	B
Consultancy firms	14.1	B	14.3	B	23.1	B
Competitors and other enterprises from same industry	8.7	A	4.3	A	32.5	E
Universities or other higher education institutes	8.5	B	0.0	A	52.6	E
Federal government research laboratories	0.0	A	0.0	A	61.3	E
Provincial/territorial government research laboratories	0.0	A	0.0	A	57.3	E
Private non-profit research laboratories	0.0	A	0.0	A	63.4	E
Surveying and mapping (except geophysical)						
Suppliers of software, hardware, materials, or equipment	32.4	B	12.6	B	10.8	B
Clients or customers	31.7	B	24.8	B	13.9	B
Consultancy firms	23.2	B	5.2	A	13.3	B
Competitors and other enterprises from same industry	9.3	B	0.0	A	17.9	B
Universities or other higher education institutes	17.2	B	4.1	B	27.7	B
Federal government research laboratories	6.4	B	0.0	A	37.9	B
Provincial/territorial government research laboratories	3.8	B	0.0	A	43.8	B
Private non-profit research laboratories	0.0	A	0.0	A	43.8	B
Testing laboratories						
Suppliers of software, hardware, materials, or equipment	32.7	B	18.6	B	2.3	A
Clients or customers	28.9	B	39.7	B	4.2	A
Consultancy firms	2.7	A	11.3	B	7.5	B
Competitors and other enterprises from same industry	15.1	B	7.7	B	15.8	B
Universities or other higher education institutes	4.8	A	2.3	A	25.2	B
Federal government research laboratories	2.0	A	2.7	A	22.5	B
Provincial/territorial government research laboratories	4.1	A	0.0	A	27.9	B
Private non-profit research laboratories	4.1	A	0.0	A	39.4	B

Table 5A (con't): Percentage of innovative establishments using external sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Industrial design services						
Suppliers of software, hardware, materials, or equipment	37.7	B	29.5	B	0.0	A
Clients or customers	33.5	B	49.3	B	0.0	A
Consultancy firms	17.2	B	13.0	B	19.8	B
Competitors and other enterprises from same industry	19.2	B	43.2	B	0.0	A
Universities or other higher education institutes	23.3	B	0.0	A	26.0	B
Federal government research laboratories	0.0	A	0.0	A	26.0	B
Provincial/territorial government research laboratories	0.0	A	0.0	A	45.8	E
Private non-profit research laboratories	0.0	A	0.0	A	52.7	B
Computer system design and related services						
Suppliers of software, hardware, materials, or equipment	28.7	B	9.3	B	9.9	B
Clients or customers	34.4	B	53.3	B	0.9	A
Consultancy firms	5.1	B	4.5	A	23.4	B
Competitors and other enterprises from same industry	21.8	B	7.0	B	3.2	A
Universities or other higher education institutes	4.4	A	0.0	A	25.1	B
Federal government research laboratories	1.3	A	0.0	A	36.3	B
Provincial/territorial government research laboratories	0.0	A	0.6	A	42.0	B
Private non-profit research laboratories	0.6	A	0.0	A	38.2	B
Total management, scientific and technical consulting services						
Suppliers of software, hardware, materials, or equipment	23.7	B	22.0	B	12.9	B
Clients or customers	26.0	B	48.8	B	5.1	B
Consultancy firms	9.5	A	7.6	B	23.2	B
Competitors and other enterprises from same industry	22.2	B	4.1	A	9.7	B
Universities or other higher education institutes	13.1	A	1.6	A	29.7	B
Federal government research laboratories	2.3	A	0.5	A	40.6	B
Provincial/territorial government research laboratories	1.2	A	0.5	A	45.7	B
Private non-profit research laboratories	0.6	A	1.7	A	48.8	B
Total research and development services						
Suppliers of software, hardware, materials, or equipment	20.7	B	13.2	B	10.2	B
Clients or customers	26.4	B	44.9	B	1.6	A
Consultancy firms	15.6	B	2.8	A	14.0	B
Competitors and other enterprises from same industry	23.1	B	9.7	B	12.9	B
Universities or other higher education institutes	28.3	B	17.8	B	7.5	A
Federal government research laboratories	3.3	A	10.7	B	25.7	B
Provincial/territorial government research laboratories	3.4	A	4.3	A	27.8	B
Private non-profit research laboratories	4.7	A	4.3	A	25.2	B

Table 6A: Percentage of innovative establishments using generally available sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Professional conferences, meetings, journals	47.0	B	8.8	A	5.4	B
Trade fairs and exhibitions	22.0	B	7.6	A	11.4	B
Trade associations	20.0	B	4.1	A	9.9	B
Internet	35.1	B	15.5	B	6.6	B
Geophysical surveying and mapping						
Professional conferences, meetings, journals	22.1	B	24.6	E	2.3	A
Trade fairs and exhibitions	14.7	B	16.1	B	21.0	B
Trade associations	12.1	B	26.2	E	6.7	A
Internet	41.1	E	8.4	A	10.3	B
Surveying and mapping (except geophysical)						
Professional conferences, meetings, journals	47.9	B	21.9	B	0.0	A
Trade fairs and exhibitions	24.5	B	13.0	B	3.2	A
Trade associations	10.5	B	13.0	B	14.8	B
Internet	26.3	B	29.6	B	0.0	A
Testing laboratories						
Professional conferences, meetings, journals	50.5	B	23.5	B	8.1	A
Trade fairs and exhibitions	23.7	B	16.5	B	6.4	A
Trade associations	24.0	B	9.5	B	9.1	B
Internet	30.5	B	18.8	B	6.4	A
Industrial design services						
Professional conferences, meetings, journals	63.7	B	6.8	B	0.0	A
Trade fairs and exhibitions	63.7	B	6.8	B	0.0	A
Trade associations	43.8	E	0.0	A	6.8	B
Internet	37.7	B	38.3	B	0.0	A
Computer system design and related services						
Professional conferences, meetings, journals	26.9	B	15.6	B	5.8	B
Trade fairs and exhibitions	20.2	B	17.8	B	6.5	B
Trade associations	22.6	B	4.3	A	16.5	B
Internet	35.3	B	28.9	B	5.6	B
Total management, scientific and technical consulting services	30.0	B	27.4	B	4.7	B
Professional conferences, meetings, journals	24.3	B	15.0	B	9.8	B
Trade fairs and exhibitions	22.4	B	11.4	B	7.7	B
Trade associations	21.6	B	29.2	B	5.0	A
Internet	30.0	B	27.4	B	4.7	B

Table 6A (con't): Percentage of innovative establishments using generally available sources of information needed for suggesting or contributing to the development of innovation, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Total research and development services						
Professional conferences, meetings, journals	35.6	B	29.1	B	0.3	A
Trade fairs and exhibitions	27.6	B	11.6	B	4.1	A
Trade associations	21.0	B	10.7	B	11.7	B
Internet	28.9	B	33.4	B	4.2	A

Table 7A: Percentage of innovative establishments engaged in activities linked to product or process innovation, 2001 to 2003

	Internal research and development		External research and development		Acquisition of equipment and machinery	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	74.7	B	28.2	B	56.3	B
Geophysical surveying and mapping	65.5	E	36.6	E	70.9	E
Surveying and mapping (except geophysical)	61.5	B	19.2	B	85.3	B
Testing laboratories	76.1	B	42.3	B	82.2	B
Industrial design services	93.2	B	35.7	B	79.5	B
Computer systems design and related services	91.0	B	23.3	B	72.7	B
Total management, scientific and technical consulting services	72.9	B	39.4	B	63.1	B
Total scientific research and development services	96.9	A	63.0	B	71.5	B

Table 7A (con't): Percentage of innovative establishments engaged in activities linked to product or process innovation, 2001 to 2003

	Acquisition of other external knowledge		Training		Market introduction of innovations	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	46.1	B	82.5	B	70.2	B
Geophysical surveying and mapping	53.2	E	75.3	E	61.5	E
Surveying and mapping (except geophysical)	48.1	B	85.1	B	52.6	B
Testing laboratories	33.7	B	67.7	B	57.1	B
Industrial design services	43.8	E	62.3	B	87.0	B
Computer systems design and related services	39.4	B	75.4	B	78.5	B
Total management, scientific and technical consulting services	42.0	B	84.6	B	65.2	B
Total scientific research and development services	52.9	B	76.8	B	76.8	B

Table 8A: Percentage of innovative establishments indicating where their product (goods or services) innovations that were introduced during the period 2001 to 2003 were developed

	Mainly within the establishment or the firm they are part of		In co-operation with other firms or organizations		Mainly other firms or organizations	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	61.3	B	17.9	B	1.2	A
Geophysical surveying and mapping	31.0	E	16.1	B	6.5	A
Surveying and mapping (except geophysical)	35.7	B	10.8	B	5.5	B
Testing laboratories	45.6	B	15.3	B	13.1	B
Industrial design services	80.8	B	12.3	B	0.0	A
Computer systems design and related services	77.8	B	13.0	B	1.7	A
Total management, scientific and technical consulting services	53.5	B	23.1	B	3.8	A
Total scientific research and development services	57.3	B	19.4	B	0.3	A

Table 9A: Percentage of innovative establishments indicating where their process innovations that were introduced during the period 2001 to 2003 were developed

	Mainly within the establishment or the firm they are part of		In co-operation with other firms or organizations		Mainly other firms or organizations	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	44.0	B	9.5	B	4.3	A
Geophysical surveying and mapping	29.0	E	30.4	E	12.1	B
Surveying and mapping (except geophysical)	77.9	B	3.2	A	13.0	B
Testing laboratories	34.9	B	14.3	B	15.5	B
Industrial design services	39.0	B	0.0	A	19.2	B
Computer systems design and related services	37.4	B	3.3	A	7.5	B
Total management, scientific and technical consulting services	58.1	B	16.8	B	1.3	A
Total scientific research and development services	41.8	B	24.2	B	2.3	A

Table 10A: Percentage of innovative establishments involved in cooperative and collaborative arrangements and reasons for involvement, 2001 to 2003

	%	Reliability
Engineering services	51.1	B
Geophysical surveying and mapping	54.4	E
Surveying and mapping (except geophysical)	44.6	B
Testing laboratories	57.5	B
Industrial design services	80.2	B
Computer systems design and related services	57.3	B
Total management, scientific and technical consulting services	65.6	B
Total scientific research and development services	78.6	B

Table 11A: Percentage of innovative establishments in cooperative or collaborative arrangements indicating reasons for involvement in cooperative and collaborative arrangements, 2001 to 2003

	Sharing costs		Spreading risk		Accessing research and development		Prototype development	
	%	Reliability	%	Reliability	%	Reliability	%	Reliability
Engineering services	62.9	B	58.9	B	33.8	B	43.4	B
Geophysical surveying and mapping	55.6	E	18.5	E	29.6	E	25.9	E
Surveying and mapping (except geophysical)	85.7	B	48.1	E	62.4	E	29.7	B
Testing laboratories	69.8	E	57.6	E	39.3	E	21.7	B
Industrial design services	53.8	E	24.7	E	59.0	E	57.2	E
Computer systems design and related services	62.6	B	45.8	B	40.0	B	31.7	B
Total management, scientific and technical consulting services	50.7	B	33.4	B	41.2	B	35.6	B
Total scientific research and development services	56.5	B	27.9	B	69.1	B	51.5	B

Table 11A (con't): Percentage of innovative establishments in cooperative or collaborative arrangements indicating reasons for involvement in cooperative and collaborative arrangements, 2001 to 2003

	Scaling-up production process		Accessing critical expertise		Accessing new markets		Accessing new distribution channels	
	%	Reliability	%	Reliability	%	Reliability	%	Reliability
Engineering services	15.3	B	59.8	B	58.4	B	10.9	B
Geophysical surveying and mapping	11.1	E	66.7	E	37.0	E	25.9	E
Surveying and mapping (except geophysical)	8.5	B	74.6	E	74.6	E	44.2	E
Testing laboratories	11.7	B	70.8	E	28.1	B	21.7	B
Industrial design services	29.9	E	62.4	E	57.2	E	40.1	E
Computer systems design and related services	15.1	B	68.5	B	53.5	B	27.0	B
Total management, scientific and technical consulting services	2.4	A	51.7	B	70.3	B	32.9	B
Total scientific research and development services	14.0	B	75.5	B	31.7	B	27.4	B

Table 12A: Percentage of establishments with unsuccessful or not yet completed projects to develop or introduce new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services), 2001 to 2003

	All		Innovators		Non-innovators	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	27.5	B	43.5	B	7.7	B
Geophysical surveying and mapping	21.5	B	37.1	E	0.0	A
Surveying and mapping (except geophysical)	20.5	B	40.0	B	0.0	A
Testing laboratories	32.6	B	59.1	B	4.1	A
Industrial design services	33.2	B	55.5	B	7.2	B
Computer systems design and related services	56.3	B	61.7	B	19.6	E
Total management, scientific and technical consulting services	29.7	B	57.8	B	4.8	A
Total scientific research and development services	52.1	B	61.5	B	33.4	B

Table 13A: Percentage of innovative establishments with economic problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services), 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Risk related to the feasibility of innovative projects	28.7	B	18.2	B	11.3	B
Risk in terms of innovation's market success	25.7	B	16.4	B	10.3	B
Innovation costs too high	18.2	B	14.8	B	10.2	B
Lack of appropriate sources of finance	13.3	B	11.3	B	19.0	B
Geophysical surveying and mapping						
Risk related to the feasibility of innovative projects	12.5	B	20.1	B	24.7	E
Risk in terms of innovation's market success	10.5	B	14.1	B	33.1	E
Innovation costs too high	22.5	B	14.1	B	16.6	B
Lack of appropriate sources of finance	6.4	A	22.4	E	30.8	E
Surveying and mapping (except geophysical)						
Risk related to the feasibility of innovative projects	20.9	B	7.6	B	23.2	B
Risk in terms of innovation's market success	28.5	B	14.0	B	20.0	B
Innovation costs too high	20.6	B	6.4	B	26.5	B
Lack of appropriate sources of finance	5.5	B	3.2	A	30.8	B
Testing laboratories						
Risk related to the feasibility of innovative projects	30.7	B	17.9	B	0.0	A
Risk in terms of innovation's market success	26.3	B	17.7	B	2.7	A
Innovation costs too high	11.9	B	43.5	B	0.0	A
Lack of appropriate sources of finance	21.6	B	16.2	B	7.3	B
Industrial design services						
Risk related to the feasibility of innovative projects	39.0	B	32.8	B	0.0	A
Risk in terms of innovation's market success	39.0	B	26.7	B	0.0	A
Innovation costs too high	56.8	B	19.2	B	0.0	A
Lack of appropriate sources of finance	0.0	A	39.0	B	6.8	B
Computer system design and related services						
Risk related to the feasibility of innovative projects	28.6	B	7.5	A	8.0	B
Risk in terms of innovation's market success	39.5	B	16.9	B	11.7	B
Innovation costs too high	31.3	B	11.5	B	13.8	B
Lack of appropriate sources of finance	13.4	B	25.1	B	19.4	B
Total management, scientific and technical services						
Risk related to the feasibility of innovative projects	14.9	B	7.3	A	18.6	B
Risk in terms of innovation's market success	14.2	B	13.5	B	15.1	B
Innovation costs too high	15.5	B	18.7	B	13.4	B
Lack of appropriate sources of finance	22.9	B	15.1	B	19.4	B

Table 13A (con't): Percentage of innovative establishments with economic problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes (including improved ways of delivering goods or services), 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Total research and development services						
Risk related to the feasibility of innovative projects	32.9	B	20.6	B	6.8	A
Risk in terms of innovation's market success	36.9	B	17.6	B	8.5	A
Innovation costs too high	25.3	B	15.7	B	8.2	A
Lack of appropriate sources of finance	24.6	B	22.5	B	9.7	A

Table 14A: Percentage of innovative establishments with internal problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Organizational rigidities within the enterprise	7.4	B	2.4	A	14.5	B
Inability to devote staff on on-going basis due to production requirements	30.1	B	16.7	B	10.2	B
Lack of qualified personnel	16.9	B	4.6	A	13.8	B
Lack of information on technology	8.9	B	0.0	A	12.9	B
Lack of information on markets	7.1	B	8.5	B	15.1	B
Geophysical surveying and mapping						
Organizational rigidities within the enterprise	10.3	B	0.0	A	40.9	E
Inability to devote staff on on-going basis due to production requirements	16.1	B	20.4	B	22.4	E
Lack of qualified personnel	18.4	B	14.1	B	16.4	B
Lack of information on technology	2.0	A	0.0	A	28.4	E
Lack of information on markets	6.0	B	2.0	A	30.4	E
Surveying and mapping (except geophysical)						
Organizational rigidities within the enterprise	13.4	B	13.5	B	30.3	B
Inability to devote staff on on-going basis due to production requirements	32.4	B	5.5	B	16.0	B
Lack of qualified personnel	11.4	B	5.2	A	7.0	B
Lack of information on technology	15.2	B	0.0	A	10.8	B
Lack of information on markets	0.0	A	11.9	B	14.7	B
Testing laboratories						
Organizational rigidities within the enterprise	13.6	B	0.0	A	8.9	B
Inability to devote staff on on-going basis due to production requirements	18.6	B	26.2	B	17.6	B
Lack of qualified personnel	34.3	B	2.7	A	16.9	B
Lack of information on technology	17.5	B	0.0	A	11.5	B
Lack of information on markets	18.6	B	2.1	A	11.5	B
Industrial design services						
Organizational rigidities within the enterprise	0.0	A	0.0	A	39.0	B
Inability to devote staff on on-going basis due to production requirements	19.2	B	17.8	B	39.0	B
Lack of qualified personnel	6.2	B	6.8	B	12.3	B
Lack of information on technology	19.2	B	0.0	A	19.2	B
Lack of information on markets	26.0	B	0.0	A	19.2	B

Table 14A (con't): Percentage of innovative establishments with internal problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Computer system design and related services						
Organizational rigidities within the enterprise	6.5	B	4.1	A	22.5	B
Inability to devote staff on on-going basis due to production requirements	23.8	B	12.0	B	10.3	B
Lack of qualified personnel	10.0	B	0.2	A	5.2	A
Lack of information on technology	5.4	B	0.0	A	15.4	B
Lack of information on markets	17.9	B	4.6	A	6.9	A
Total management, scientific and technical services						
Organizational rigidities within the enterprise	10.2	B	0.0	A	22.5	B
Inability to devote staff on on-going basis due to production requirements	28.5	B	13.3	B	10.3	B
Lack of qualified personnel	11.0	B	1.9	A	12.6	B
Lack of information on technology	1.1	A	0.0	A	19.5	B
Lack of information on markets	9.7	B	1.3	A	15.8	B
Total research and development services						
Organizational rigidities within the enterprise	7.7	B	1.9	A	10.1	B
Inability to devote staff on on-going basis due to production requirements	18.3	B	8.6	A	7.0	A
Lack of qualified personnel	7.9	A	2.5	A	2.6	A
Lack of information on technology	6.4	A	1.7	A	8.8	A
Lack of information on markets	26.5	B	6.2	A	6.1	A

Table 15A: Percentage of innovative establishments with other problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Insufficient flexibility of regulations or standards	7.5	B	3.0	A	25.6	B
Lack of customer responsiveness to new goods or services	18.4	B	6.8	A	12.5	B
Lack of industry-wide standards	14.6	B	1.6	A	23.2	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	0.0	A	0.0	A	42.8	B
Geophysical surveying and mapping						
Insufficient flexibility of regulations or standards	4.8	A	6.0	B	40.5	E
Lack of customer responsiveness to new goods or services	10.5	B	14.1	B	18.4	B
Lack of industry-wide standards	0.0	A	12.1	B	33.1	E
Lack of regulations in e-commerce as obstacle to exporting innovative products	0.0	A	0.0	A	75.0	B
Surveying and mapping (except geophysical)						
Insufficient flexibility of regulations or standards	17.5	B	0.0	A	42.4	B
Lack of customer responsiveness to new goods or services	12.8	B	0.0	A	25.5	B
Lack of industry-wide standards	8.5	A	0.0	A	35.6	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	0.0	A	0.0	A	53.0	B
Testing laboratories						
Insufficient flexibility of regulations or standards	21.4	B	12.1	B	10.2	B
Lack of customer responsiveness to new goods or services	34.8	B	7.3	B	2.1	A
Lack of industry-wide standards	16.3	B	7.3	B	6.9	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	5.4	B	0.0	A	40.3	B
Industrial design services						
Insufficient flexibility of regulations or standards	12.3	B	0.0	A	17.8	B
Lack of customer responsiveness to new goods or services	26.0	B	13.0	B	0.0	A
Lack of industry-wide standards	0.0	A	0.0	A	32.2	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	0.0	A	0.0	A	73.3	B
Computer system design and related services						
Insufficient flexibility of regulations or standards	1.3	A	2.0	A	34.5	B
Lack of customer responsiveness to new goods or services	18.0	B	4.4	A	12.4	B
Lack of industry-wide standards	10.1	B	1.7	A	32.0	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	2.2	A	0.0	A	37.8	B

Table 15A (con't): Percentage of innovative establishments with other problems and obstacles that slowed down or caused problems when developing new or significantly improved products (goods or services) or processes, 2001 to 2003

	Importance				Not relevant	
	Moderately high		High			
	%	Reliability	%	Reliability	%	Reliability
Total management, scientific and technical services						
Insufficient flexibility of regulations or standards	2.5	A	0.7	A	43.4	B
Lack of customer responsiveness to new goods or services	15.1	B	8.1	B	15.7	B
Lack of industry-wide standards	5.1	A	3.3	A	30.2	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	1.2	A	0.0	A	60.2	B
Total research and development services						
Insufficient flexibility of regulations or standards	13.7	B	14.6	B	19.9	B
Lack of customer responsiveness to new goods or services	22.3	B	7.9	B	18.7	B
Lack of industry-wide standards	7.8	A	0.3	A	30.2	B
Lack of regulations in e-commerce as obstacle to exporting innovative products	0.9	A	3.9	A	46.1	B

Table 16A: Percentage of innovative establishments that used support programs of the federal or provincial/territorial governments between 2001 and 2003

	Government programs				Did not use government program	
	Federal government		Provincial/ territorial government			
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Research and development (R&D) tax credits	26.3	E	12.8	E	70.0	E
Government research and development (R&D) grants	6.5	E	7.8	B	88.9	E
Government venture capital support	4.1	B	1.6	B	94.4	E
Government technology support and assistance programs	9.8	E	4.2	B	88.7	E
Government information or internet services	42.0	E	38.5	E	52.6	E
Government support for training	8.9	E	10.7	E	86.8	E
Other government support programs	2.6	B	0.4	B	97.1	B
Geophysical surveying and mapping						
Research and development (R&D) tax credits	25.0	E	4.4	B	75.0	E
Government research and development (R&D) grants	7.9	E	2.4	B	89.7	E
Government venture capital support	0.0	B	0.0	B	100.0	B
Government technology support and assistance programs	0.0	B	2.0	B	98.0	B
Government information or internet services	16.2	E	12.4	E	81.6	E
Government support for training	6.0	E	8.3	E	85.7	E
Other government support programs	0.0	B	0.0	B	100.0	B
Surveying and mapping (except geophysical)						
Research and development (R&D) tax credits	21.9	E	12.2	E	78.1	E
Government research and development (R&D) grants	17.5	E	2.6	B	82.5	E
Government venture capital support	0.0	B	0.0	B	100.0	B
Government technology support and assistance programs	11.1	E	0.0	B	88.9	E
Government information or internet services	25.5	E	20.0	E	67.2	E
Government support for training	2.6	B	2.5	B	94.9	B
Other government support programs	2.6	B	7.6	E	89.8	E
Testing laboratories						
Research and development (R&D) tax credits	24.8	E	9.0	E	75.2	E
Government research and development (R&D) grants	11.0	E	2.7	B	89.0	E
Government venture capital support	0.0	B	0.0	B	100.0	B
Government technology support and assistance programs	4.0	B	4.2	B	91.7	E
Government information or internet services	20.7	E	17.0	E	77.2	E
Government support for training	9.8	E	25.2	E	65.0	E
Other government support programs	5.8	E	2.7	B	91.5	E

Table 16A (con't): Percentage of innovative establishments that used support programs of the federal or provincial/territorial governments between 2001 and 2003

	Government programs				Did not use government program	
	Federal government		Provincial/ territorial government			
	%	Reliability	%	Reliability	%	Reliability
Industrial design services						
Research and development (R&D) tax credits	52.7	E	52.7	E	47.3	E
Government research and development (R&D) grants	37.7	E	0.0	B	62.3	E
Government venture capital support	13.0	E	19.8	E	67.2	E
Government technology support and assistance programs	0.0	B	0.0	B	100.0	B
Government information or internet services	F	F	19.8	E	F	F
Government support for training	19.8	E	19.8	E	F	F
Other government support programs	0.0	B	6.8	E	93.2	E
Computer systems design and related services						
Research and development (R&D) tax credits	53.8	E	40.7	E	41.8	E
Government research and development (R&D) grants	6.1	B	3.3	B	92.3	B
Government venture capital support	1.0	B	1.1	B	98.0	B
Government technology support and assistance programs	8.6	B	3.0	B	90.3	E
Government information or internet services	21.8	E	12.3	E	75.5	E
Government support for training	4.1	B	9.7	E	87.0	E
Other government support programs	4.4	B	6.9	B	89.6	E
Total management, scientific and technical consulting services						
Research and development (R&D) tax credits	19.4	E	14.5	E	79.0	E
Government research and development (R&D) grants	7.7	E	3.3	B	91.7	E
Government venture capital support	1.4	B	0.4	B	98.6	B
Government technology support and assistance programs	4.9	B	0.8	B	94.5	B
Government information or internet services	38.1	E	28.3	E	58.8	E
Government support for training	10.7	E	7.5	B	84.2	E
Other government support programs	5.5	E	3.3	B	92.0	E
Total scientific research and development services						
Research and development (R&D) tax credits	62.9	E	47.9	E	36.1	E
Government research and development (R&D) grants	33.0	E	18.6	E	64.2	E
Government venture capital support	9.8	E	7.8	E	84.3	E
Government technology support and assistance programs	17.7	E	9.2	E	75.5	E
Government information or internet services	27.6	E	26.1	E	68.1	E
Government support for training	18.6	E	14.4	E	71.0	E
Other government support programs	11.1	E	5.2	B	85.9	E

Table 17A: Percentage of innovative establishments that indicated an impact from new or significantly improved products (goods or services) or processes developed and introduced, 2001 to 2003

	Agree		Strongly agree		Not relevant	
	%	Reliability	%	Reliability	%	Reliability
Engineering services						
Increased the business unit's productivity	47.4	B	11.6	B	4.9	B
Increased the business unit's profitability	55.3	B	13.4	B	0.5	A
Increased the speed of supplying and/or delivering services or goods	42.5	B	7.8	B	18.1	B
Increased the ability to adapt flexibly to different client demands	58.5	B	12.5	B	7.2	B
Increased business unit's domestic market share	29.5	B	7.9	A	13.6	B
Increased business unit's international market share	20.5	B	5.1	A	35.8	B
Allowed business unit to maintain its profit margins	51.6	B	15.1	B	1.3	A
Allowed business unit to keep up with its competitors	59.1	B	24.6	B	4.3	A
Decreased the cost of producing products (goods or services)	28.1	B	7.1	A	16.0	B
Improved the quality of products (goods or services)	59.9	B	23.2	B	10.3	B
Geophysical surveying and mapping						
Increased the business unit's productivity	65.5	E	30.6	E	10.3	B
Increased the business unit's profitability	65.1	E	32.2	E	14.3	B
Increased the speed of supplying and/or delivering services or goods	51.0	E	22.4	E	12.3	B
Increased the ability to adapt flexibly to different client demands	59.2	E	29.0	E	10.3	B
Increased business unit's domestic market share	38.2	E	32.2	E	28.7	E
Increased business unit's international market share	14.7	B	2.4	A	68.9	B
Allowed business unit to maintain its profit margins	46.6	E	28.4	E	14.3	B
Allowed business unit to keep up with its competitors	69.3	E	38.9	E	8.3	B
Decreased the cost of producing products (goods or services)	33.1	E	22.4	E	8.3	B
Improved the quality of products (goods or services)	65.1	E	44.9	E	8.3	B
Surveying and mapping (except geophysical)						
Increased the business unit's productivity	59.6	B	25.1	B	5.5	B
Increased the business unit's profitability	59.3	B	15.5	B	5.5	B
Increased the speed of supplying and/or delivering services or goods	56.9	B	27.5	B	5.5	B
Increased the ability to adapt flexibly to different client demands	51.0	B	10.2	B	8.7	B
Increased business unit's domestic market share	26.2	B	11.1	B	11.7	B
Increased business unit's international market share	9.6	B	5.8	B	47.9	B
Allowed business unit to maintain its profit margins	45.9	B	14.9	B	9.2	B
Allowed business unit to keep up with its competitors	60.7	B	29.7	B	13.0	B
Decreased the cost of producing products (goods or services)	32.0	B	7.6	B	12.4	B
Improved the quality of products (goods or services)	57.6	B	23.3	B	13.9	B

Table 17A (con't): Percentage of innovative establishments that indicated an impact from new or significantly improved products (goods or services) or processes developed and introduced, 2001 to 2003

	Agree		Strongly agree		Not relevant	
	%	Reliability	%	Reliability	%	Reliability
Testing laboratories						
Increased the business unit's productivity	45.3	B	4.8	A	7.1	B
Increased the business unit's profitability	35.3	B	2.1	A	4.8	A
Increased the speed of supplying and/or delivering services or goods	38.5	B	8.1	B	11.1	B
Increased the ability to adapt flexibly to different client demands	54.3	B	13.6	B	7.1	B
Increased business unit's domestic market share	33.6	B	2.7	A	2.7	A
Increased business unit's international market share	21.6	B	9.5	B	31.3	B
Allowed business unit to maintain its profit margins	31.8	B	8.3	B	14.4	B
Allowed business unit to keep up with its competitors	65.3	B	33.2	B	2.1	A
Decreased the cost of producing products (goods or services)	12.3	B	2.1	A	9.2	B
Improved the quality of products (goods or services)	59.9	B	19.1	B	6.7	B
Industrial design services						
Increased the business unit's productivity	73.3	B	30.2	B	26.7	B
Increased the business unit's profitability	55.5	B	26.0	B	19.8	B
Increased the speed of supplying and/or delivering services or goods	56.2	E	29.5	B	26.7	B
Increased the ability to adapt flexibly to different client demands	93.2	B	60.3	E	0.0	A
Increased business unit's domestic market share	19.8	B	0.0	A	6.8	B
Increased business unit's international market share	52.7	B	13.0	B	30.8	B
Allowed business unit to maintain its profit margins	63.0	B	19.8	B	19.8	B
Allowed business unit to keep up with its competitors	80.2	B	43.2	B	0.0	A
Decreased the cost of producing products (goods or services)	43.2	B	17.2	B	26.7	B
Improved the quality of products (goods or services)	89.7	B	63.7	B	0.0	A
Computer systems design and related services						
Increased the business unit's productivity	45.6	B	10.8	B	18.9	B
Increased the business unit's profitability	43.5	B	11.5	B	3.8	A
Increased the speed of supplying and/or delivering services or goods	45.4	B	17.2	B	26.5	B
Increased the ability to adapt flexibly to different client demands	68.3	B	31.9	B	9.3	B
Increased business unit's domestic market share	24.2	B	8.5	B	18.1	B
Increased business unit's international market share	25.9	B	12.0	B	30.8	B
Allowed business unit to maintain its profit margins	40.0	B	14.8	B	13.6	B
Allowed business unit to keep up with its competitors	61.1	B	32.1	B	8.9	B
Decreased the cost of producing products (goods or services)	20.9	B	8.6	B	17.4	B
Improved the quality of products (goods or services)	55.7	B	19.4	B	17.8	B

Table 17A (con't): Percentage of innovative establishments that indicated an impact from new or significantly improved products (goods or services) or processes developed and introduced, 2001 to 2003

	Agree		Strongly agree		Not relevant	
	%	Reliability	%	Reliability	%	Reliability
Total management, scientific and technical consulting services						
Increased the business unit's productivity	60.7	B	20.6	B	6.0	B
Increased the business unit's profitability	52.1	B	17.5	B	7.5	B
Increased the speed of supplying and/or delivering services or goods	49.5	B	15.6	B	10.5	B
Increased the ability to adapt flexibly to different client demands	63.1	B	25.2	B	5.5	B
Increased business unit's domestic market share	30.1	B	13.0	B	13.7	B
Increased business unit's international market share	15.4	B	8.3	A	47.5	B
Allowed business unit to maintain its profit margins	34.2	B	9.4	B	19.3	B
Allowed business unit to keep up with its competitors	72.6	B	38.5	B	8.0	B
Decreased the cost of producing products (goods or services)	21.8	B	7.1	B	17.3	B
Improved the quality of products (goods or services)	73.4	B	37.2	B	5.8	B
Total research and development services						
Increased the business unit's productivity	52.8	B	14.8	B	7.7	B
Increased the business unit's profitability	40.5	B	9.8	B	30.7	B
Increased the speed of supplying and/or delivering services or goods	29.4	B	10.2	B	16.7	B
Increased the ability to adapt flexibly to different client demands	51.6	B	13.2	A	14.7	B
Increased business unit's domestic market share	19.3	B	7.2	B	37.7	B
Increased business unit's international market share	31.0	B	14.0	B	41.8	B
Allowed business unit to maintain its profit margins	36.4	B	12.7	B	39.4	B
Allowed business unit to keep up with its competitors	60.2	B	32.1	B	24.5	B
Decreased the cost of producing products (goods or services)	33.8	B	11.8	B	21.4	B
Improved the quality of products (goods or services)	72.9	B	31.6	B	12.7	B

Table 18A: Percentage of non-innovative establishments which indicated the reasons why they did not develop or introduce any new or significantly improved products (goods or services) or processes, 2001 to 2003

	Carried out prior to 2001-2003		No market demand		Lack of funds	
	%	Reliability	%	Reliability	%	Reliability
Engineering services	25.9	E	75.6	E	27.8	E
Geophysical surveying and mapping	F	F	F	F	F	F
Surveying and mapping (except geophysical)	40.3	E	75.3	E	26.5	E
Testing laboratories	27.6	E	63.7	E	40.9	E
Industrial design services	0.0	B	4.9	B	F	F
Computer systems design and related services	F	F	F	F	F	F
Total management, scientific and technical consulting services	34.2	E	58.3	E	18.0	E
Total scientific research and development services	24.7	E	29.5	E	23.9	E

Table 18B: Percentage of non-innovative establishments which indicated the reasons why they did not develop or introduce any new or significantly improved products (goods or services) or processes, 2001 to 2003

	Lack of trained staff		Other reasons	
	%	Reliability	%	Reliability
Engineering services	29.0	E	14.3	E
Geophysical surveying and mapping	F	F	F	F
Surveying and mapping (except geophysical)	16.9	E	16.4	E
Testing laboratories	10.3	B	14.9	E
Industrial design services	4.9	B	41.6	E
Computer systems design and related services	2.1	B	F	F
Total management, scientific and technical consulting services	12.1	E	15.9	E
Total scientific research and development services	21.2	E	41.4	E

Appendix III: Overview of Professional, Scientific and Technical Services industries

This part of the paper is intended to provide further information and context for the selected professional, scientific and technical services industries that were covered by the Survey of Innovation 2003. This includes information on their share of GDP, levels of employment, wages and salaries and the performance of R&D. Information is provided at the most detailed levels available. Occasionally this corresponds to the industries as surveyed but sometimes the selected industries are included in a larger group.

Under the NAICS, the professional, scientific and technical services sector comprises a nine industry groups, composed of 35 industries. Three of the nine industry groups were covered by the survey, as were 11 of the 35 industries.

Complete data are available for "Computer systems design and related services".

Data for "Engineering services", "Geophysical surveying and mapping", "Surveying and mapping (except geophysical)" and "Testing laboratories" are included in "Architectural, engineering and related services".

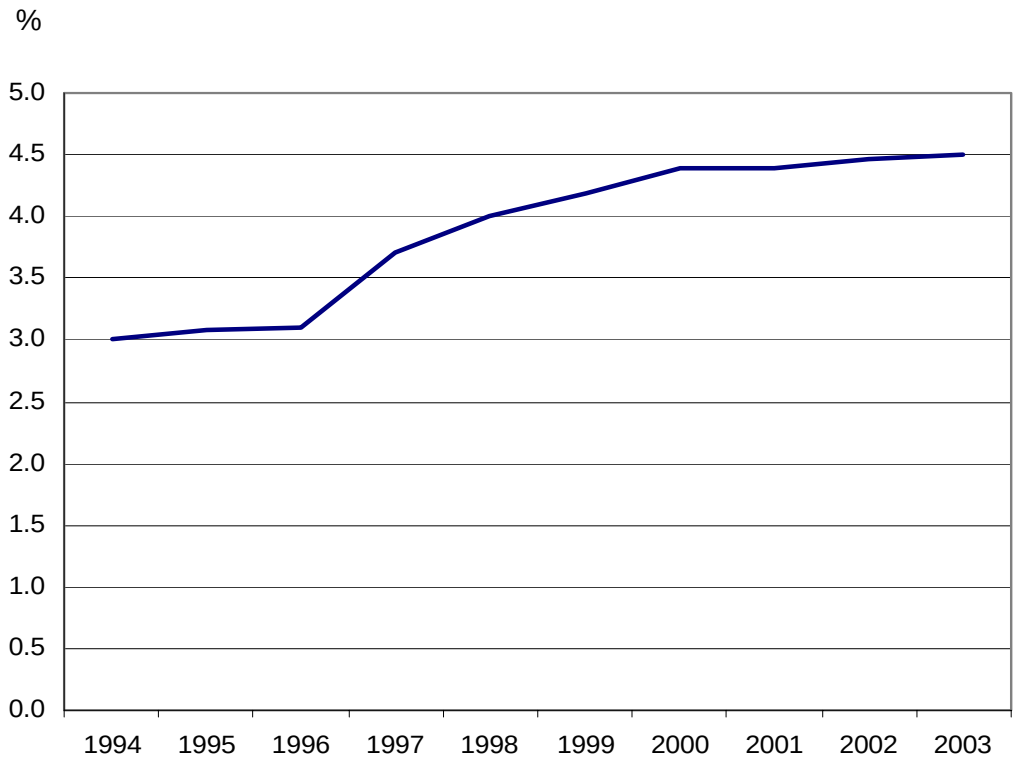
Data for "Industrial design services", "Total management, scientific and technical consulting services" and "Total research and development services", are included in "Other professional, scientific and technical services".

Data for "Legal and accounting services" and "Advertising services", which were not surveyed in the Survey of Innovation, 2003, are combined into one category and included to complete the information for the professional, scientific and technical services sector.

Gross Domestic Product (GDP or value-added)

"Professional, scientific and technical services" are an increasingly important part of the Canadian economy. Over the ten year interval from 1994 to 2003, their share of total GDP increased from 3.0% to 4.5% (Figure A1)[19]. Most of the growth took place between 1996 and 2000.

Figure A1
All professional, scientific and technical services as a percentage of GDP, 1994-2003



Source: *Statistics Canada*

19. Source: Statistics Canada, CANSIM Table 379-0020.

While none of the industries in the sector has reported declines in value-added, not all have reported substantial growth. Growth has occurred in a few key industries[20].

"Computer systems design and related services" lead the way with rapid growth during this period, increasing its share of GDP from 0.6% in 1997 to 1.1% by 2003.

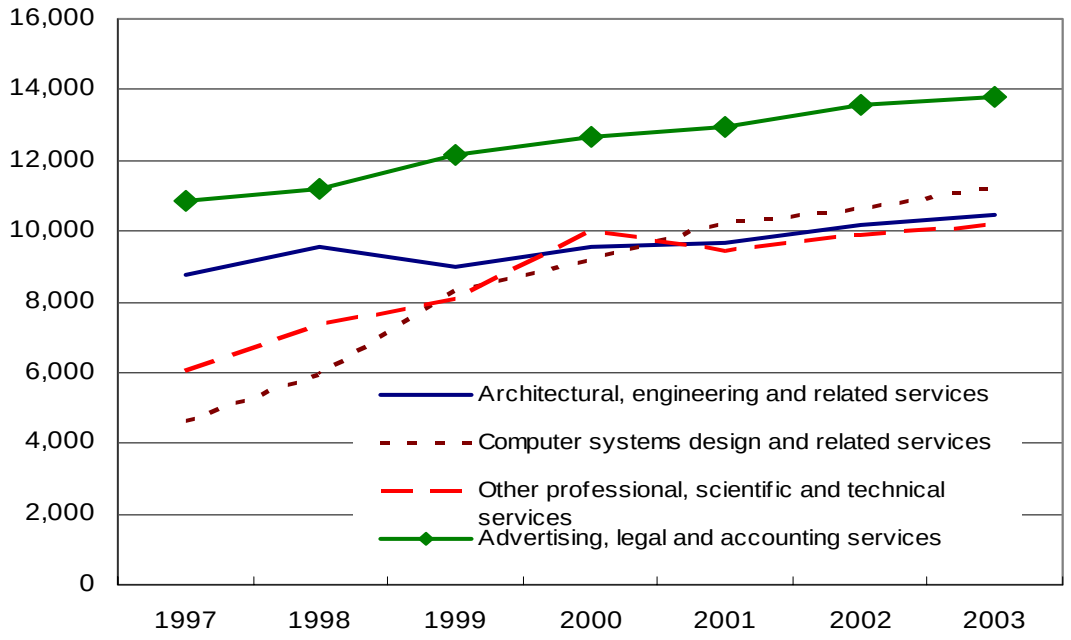
Establishments in "Other professional, scientific and technical services", comprising "Specialized design services", "Management and other technical consulting", "Research and development services" and "Other scientific and technical services", also reported growth, increasing their share from 0.7% of GDP in 1997 to 1.0% of GDP in 2003.

By contrast, "Architectural and engineering services" have remained fairly constant, at 1.1% of GDP in 1997[21] to 1.0% of GDP in 2003.

The remaining professional, scientific and technical services, "Legal services", "Accounting, tax and bookkeeping services" and "Advertising services" accounted for 1.3 to 1.4 percent of GDP during this interval.

Figure A2
Value-added of professional, scientific and technical services industries, 1997-2003

(millions of constant value 1997 dollars)



Source: *Statistics Canada*

20. Source: Statistics Canada, CANSIM Table 379-0017 for all GDP data
21. Nineteen ninety seven is the earliest year for which detailed data are available.

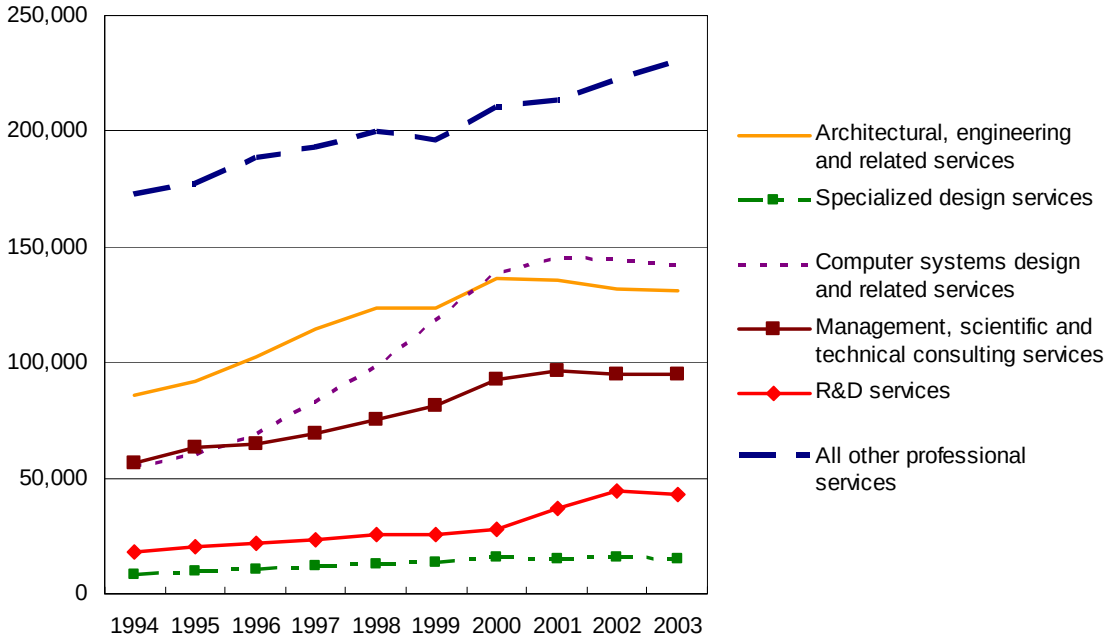
In terms of real GDP, meaning value-added in constant dollars, all professional, scientific and technical service industries reported growth, but "Computer systems design" reported the highest rate of growth, increasing from $4.6 billion in 1997 to $11.3 billion in 2003 (Figure A2). "Other professional, scientific and technical services", which includes many of the industries included in the Survey of Innovation, 2003, also reported substantial growth, increasing from $6.1 billion in 1997 to $10.2 billion in 2003.

Employment

Along with growth in terms of GDP, the professional, scientific and technical services also reported strong growth in employment that exceeded the rate of employment growth of the economy overall[22]. While overall employment and service sector employment grew 21% between 1994 and 2003, employment in professional, scientific and technical services grew by 66%.

The most dramatic rate of growth was reported by "Computer systems design" which increased from 54,692 in 1994 to 141,991 in 2003, representing an increase of 160% (Figure A3).

Figure A3
Annual employment in professional, scientific and technical services industries, 1994-2003



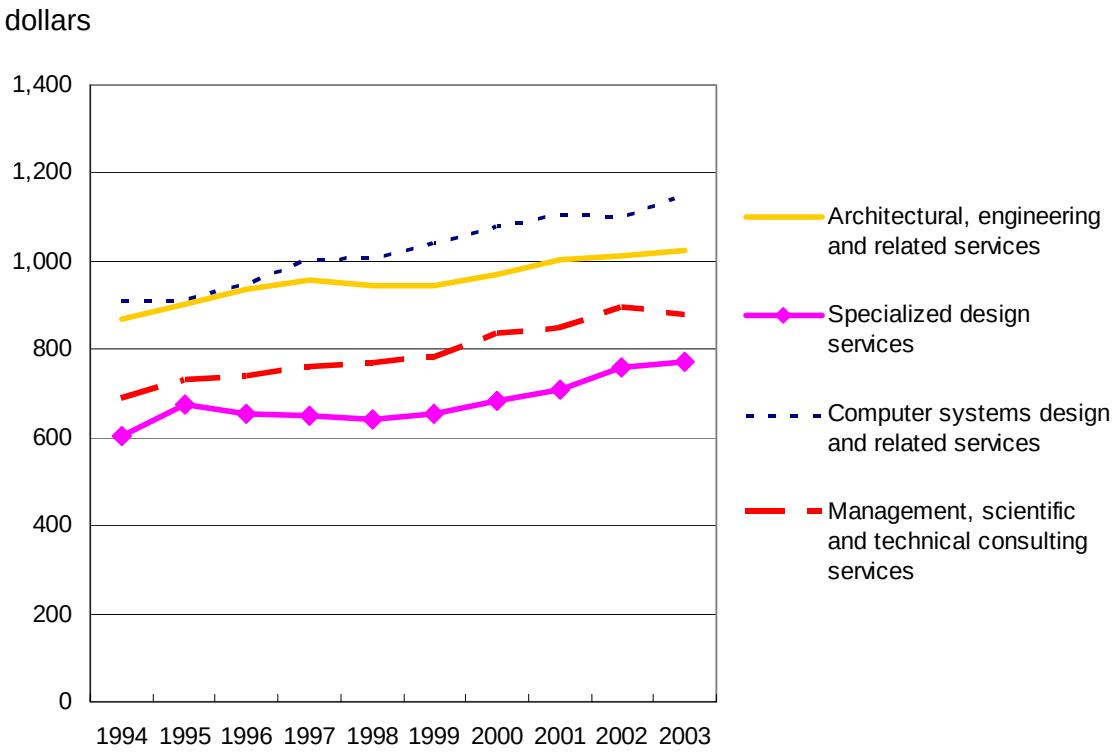
Note: R&D services data are derived from the total in all professional, scientific and technical services, less all other categories.
Source: *Statistics Canada*

22. Source: CANSIM Table 281-0024

Wages and salaries

Overall, wages and salaries for all workers in the service sector were just slightly lower than for the economy as a whole (Figure A4)[23]. Wages and salaries for a variety of professional, scientific and technical services, however, were consistently higher than wages and salaries in all industries and all service industries. In particular, "Computer systems design services" and "Architectural, engineering and related services" reported high wages and salaries. Furthermore, wages and salaries of professional, scientific and technical services workers increased at a more rapid rate than wages and salaries generally.

Figure A4
Average weekly wages and salaries for selected industries, 1994-2003



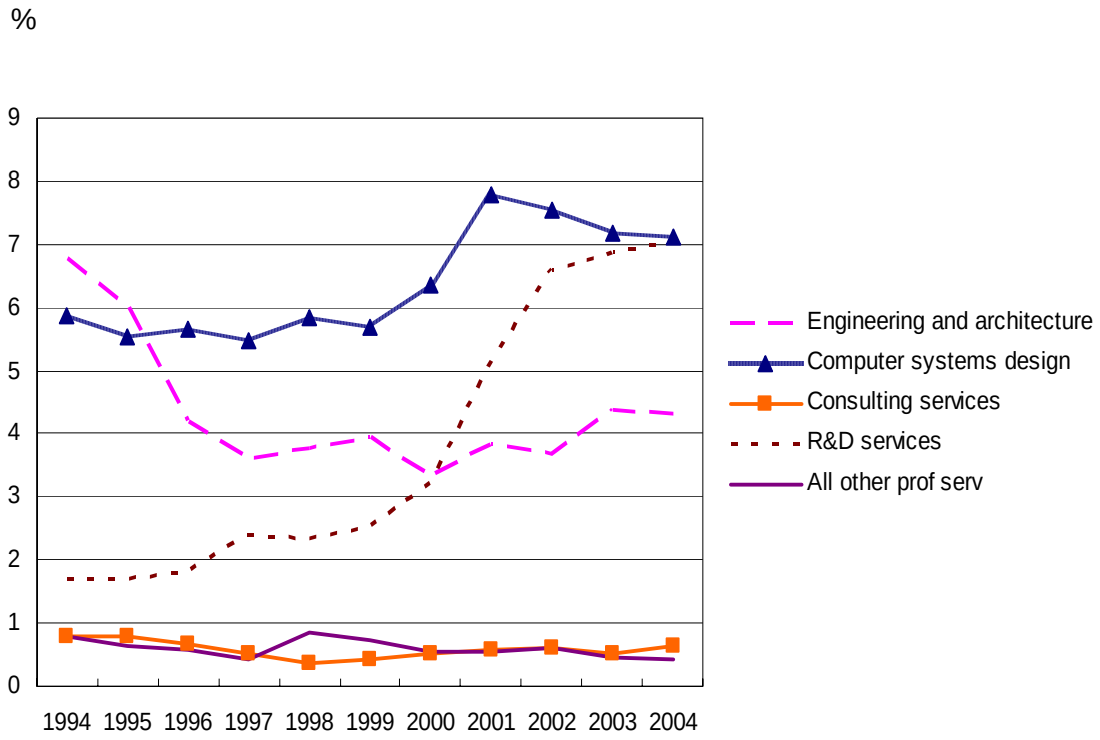
Source: *Statistics Canada*

23. Source: CANSIM Table 281-0027

R&D in professional, scientific and technical services

Professional, scientific and technical service industries are important performers of R&D. They have accounted for between 12.4% of industrial R&D in 1997, climbing to 19.5% by 2003 (Figure A5). This growth was driven by increases in R&D performed in "Computer systems design services" and even stronger growth in "Research and development services". Industrial R&D performed by "Research and development services" industries increased from 1.7% of all industrial R&D in 1994 to 7.1% by 2003.

Figure A5
Expenditures on R&D performed by selected professional, scientific and technical service industries as a percentage of total industrial R&D Expenditures, 1994-2004



Source: *Statistics Canada, Research and Development in Canadian Industry (RDCI, 2004)*

While other industries in the service sector perform R&D, no other industry group in the service sector approached the level of R&D performed by professional, scientific and technical services industries.

Professional, scientific and technical services industries are selling knowledge which is purchased by other sectors of the economy. They are performing R&D which is incorporated into products and processes of a wide range of other industries across the economy. While some professional, scientific and technical establishments serve a particular industry, others have clients across many industries, and as such, they can contribute to the rapid spread of knowledge across these industries. This makes these industries an important component of the country's innovation system.

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