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# Innovation Analysis Bulletin

Government science and  
technology activities

Industrial research  
and development

Intellectual property  
commercialization

Advanced technology  
and innovation

Biotechnology

Connectivity

Telecommunications and broadcasting

Electronic commerce

Volume 3, No. 1 (February 2001)

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## INNOVATION PARTNERS OF CANADIAN MANUFACTURING FIRMS (PAGE 3)

According to the findings of the 1999 Survey of Innovation, one third of innovative manufacturing firms in Canada develop new products and processes in collaboration with partners. The three most important reasons for this collaboration are 1. accessing critical expertise, 2. accessing R&D, and 3. prototype development. Eighty-eight percent (88%) of collaborating firms have partners in Canada and two thirds have partners in the United States.

## INTERNET BY CABLE (PAGE 5)

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Knowledge leads to innovation and innovation, in turn, sets in motion a new cycle of learning as firms try to find solutions to complex problems. A survey of innovation covering the three-year period 1994-96 ranks more than 2,000 firms on a knowledge-intensity scale.

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An OECD forum held in Ottawa aimed to advance the understanding of knowledge management at organization and enterprise levels across sectors in the emerging knowledge economy and to develop a framework identifying good practices of knowledge management in enterprises and organizations across sectors.

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## CANADIAN TELECOM - WIRELESS OR BUST (PAGE 11)

From cell phones to microwave communications, telecommunications are making waves in Canada and around the world. Despite strong growth in the Canadian telecommunications wireless sector, it is not taking over. A comprehensive quarterly survey of telecommunications service providers presents interesting observations.

## UPDATE ON INTELLECTUAL PROPERTY COMMERCIALIZATION (PAGE 13)

These figures have been revised and are presented in more detail.

## USERS AND PROVINCIAL PROVIDERS OF SCIENCE AND TECHNOLOGY STATISTICS (PAGE 13)

The Quebec Institute of Statistics hosted a forum for Statistics Canada and provincial government experts dealing with the subject of science and technology statistics.

*Innovation analysis bulletin*

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Besides the articles to which we refer in this bulletin, Statistics Canada's Web site provides a wealth of statistics, facts and research papers on a variety of related topics. As well, most of the questionnaires we have used to collect the information are available for research purposes.

As of December 2000, there were :

- Ten titles in *Downloadable publications (\$)*,
- Eight research papers,
- 35 working papers, and
- 22 questionnaires.



## Innovation Partners of Canadian Manufacturing Firms

According to the findings of the 1999 Survey of Innovation, one third of innovative manufacturing firms in Canada develop new products and processes in collaboration with partners. The three most important reasons for this collaboration are 1. accessing critical expertise, 2. accessing R&D, and 3. prototype development. Eighty-eight percent (88%) of collaborating firms have partners in Canada and two thirds have partners in the United States.

Thirty-three percent (33%) of innovative manufacturing firms in Canada develop new products and processes in collaboration with partners. The three most important reasons for this collaboration, according to the findings of the 1999 Survey of Innovation, are 1. accessing critical expertise, 2. accessing research and development, and 3. accessing new markets.

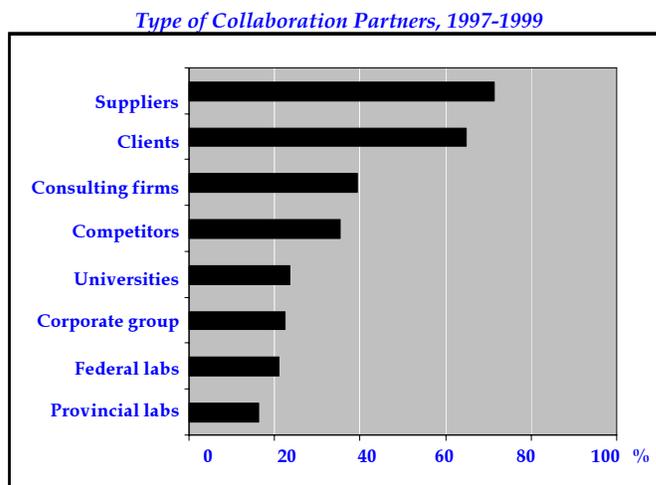
### Who are the most important types of partners?

Suppliers and clients are the most important innovation partners (approximately two thirds of innovative projects are carried out with each), indicating the importance of market partners on the supply side and on the user side in the development of innovation. The next most important set of collaborators are competitors and consultants, which account for 35-40% of partners. This is followed by firms in the same corporate group and public organizations (universities and research institutes) who are each partners for approximately one fifth of collaborating innovators.

### What are the reasons to collaborate with different types of partners?

An analysis done by the Conference Board of Canada of the 1999 Survey of Innovation data finds that reasons to collaborate with various types of partners are significantly different.

Innovative firms enter into partnership with their competitors and clients, as well as federal laboratories and universities in order to share the cost of innovation. In order to spread the risk, they form partnerships with competitors, clients and consulting firms. Partnerships



with consulting, federal laboratories and universities provide the means to access R&D necessary for the innovation project. The development process, involving prototype development and scale-up is done in partnership with clients and suppliers and in the case of scale-up with consulting firms. Accessing expertise (as opposed to accessing R&D) is the reason for partnering with suppliers, consulting firms and universities. Partnerships with competitors, clients and provincial laboratories are important reasons for collaborating in seeking new markets and consultants are key partners in establishing new distribution channels.

*Table 1: Differentiating Reasons for the Firm's Involvement in Collaboration with a Particular Type of Partner*

Type of partner	Cost sharing	Risk spreading	Accessing R&D	Prototype development	Scale-up	Expertise	New markets	Distribution channel
Competitors	X	X					X	
Clients	X	X		X	X		X	
Suppliers				X	X	X		
Consulting firms		X	X		X	X		X
Federal labs	X		X					
Provincial labs							X	
Universities	X		X			X		

Source:  
Conference Board of Canada,  
Collaborating for Innovation: 2nd Annual Innovation Report, 2000, pp. 20-26.

**Where are these partners located?**

Eighty-eight (88%) of the innovation partners are in Canada. However, many Canadian innovative firms also have partners in other countries. Two thirds of Canadian innovative firms, collaborate have partners in the United States, one third have partners in Europe, and 17% have partners in the Pacific Rim countries. International collaboration is thus very important for manufacturing firms, which are involved in collaboration innovation, in particular collaboration with the United States.

**Does country of location matter?**

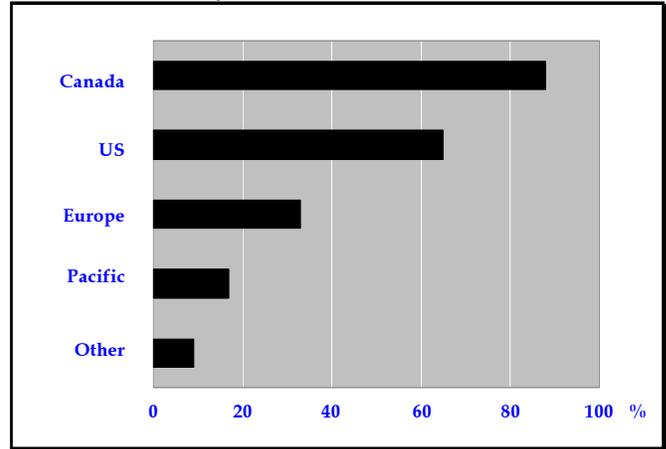
Canadian innovative firms collaborate with other private sector firm more in Canada than with firms in the US and Europe. However, US suppliers, clients, other firms in the same corporate group, and competitors are important partners as more than 50% of Canadian firms, in each case, collaborate with them. With the exception of consulting firms, between 20% and 30% of Canadian innovative firms collaborate with their European counterparts.

Patterns of collaboration with public sector partners (federal labs, provincial labs and universities) are strikingly different. Canadian innovative firms collaborate principally with Canadian public sector partners and a small percentage collaborate with American and European public sector partners (less than 20% in all cases). It is interesting to note that consulting firms have patterns of collaboration that have similarities to the public organizations, as only 30% of the innovators collaborate with US consulting companies and only 10% with European ones.

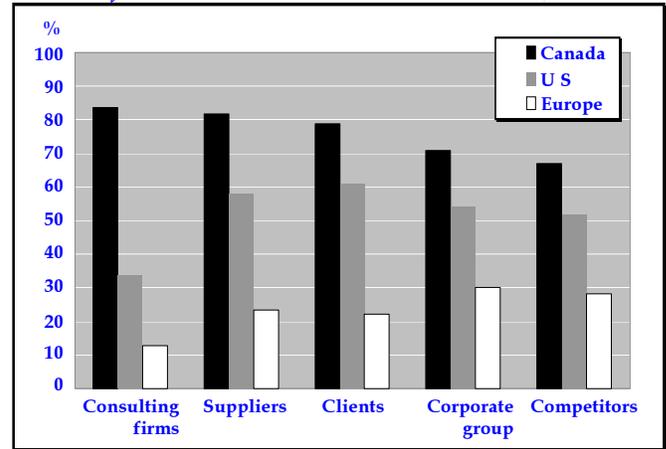
The location of the country of partners does appear to be an important factor in innovation collaboration. In general Canadian manufacturing innovative firms, when they do collaborate, enter more into to partnership with other Canadian firms or public sector organizations. In case of collaboration with public organizations, for the most part firms appear to be accessing the partners within Canada. As was shown above, the principal reasons for collaborating with these partners are cost sharing, accessing R&D and accessing expertise, as well as in the case of provincial labs accessing new markets.

However, when innovative firms are involved the development phases of their products (prototype development and scale-up) their collaborations are with clients, suppliers and consulting firms. A high percentage of these types of collaborations (around 60%) take place with US firms. Similarly when Canadian innovative firms collaborate with competitors and clients in order to share costs, spread risk and develop new markets, a high percentage of their collaborators are firms in the US.

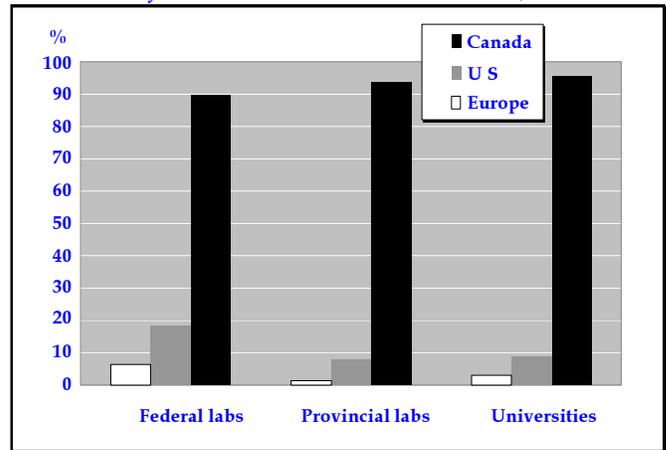
*Location of Collaboration Partners, 1997-1999*



*Location of Private Sector Firm Collaboration Partners, 1997-1999*



*Location of Public Sector Collaboration Partners, 1997-1999*



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## Internet by Cable

The adoption of the Internet by Canadian households continues to grow. There were 3.3 million connected households (28.7% of all households) in November 1999, a four fold increase in the number of connected households recorded in 1996. Access by cable accounted for about 11% of connections.

### *The situation in 1999*

The table below provides some basic facts about the Canadian cable industry. These indicators are commonly used to describe the extent of the development of the cable infrastructure and the degree to which Canadians use the services of that industry.

*Basic Cable Facts, 1999*

<b>Facts</b>	<b>Thousands</b>
Households with access to a cable network	10,757
Cable subscribers	8,024
Households with access to cable Internet	4,800
Cable Internet subscribers	364

The entry of cable operators into the Internet access service market is relatively recent. Following market trials, high-speed cable Internet services were first launched in a few large markets in November 1996 (CCTA 2000). Less than three years later, 61 cable licensees were offering these Services and close to 8% of the 4.8 million households with access to cable Internet actually subscribed to it.

High-speed Internet access by cable was most popular in Western Canada. The region accounted for 42.8% of cable Internet subscribers, compared to 33.7% of all home Internet subscribers. This is probably explained, at least in part, by the fact that households in Western Canada, and particularly in Alberta and British Columbia, adopted the Internet technology in relatively greater numbers earlier rather than later. Early adopters and regular users of the Internet are more likely to be interested in a premium service, such as that offered by cable companies.

### *A Canada - U.S. comparison*

Available statistics suggest that the deployment of cable modem service is significantly ahead in Canada, both in terms of supply and demand for the service. In 1999, 45% of households with access to a cable network also had access to Internet by cable, significantly more than the 30% achieved in the United States. On the demand side, 7.6% of households with access to cable Internet subscribed to these services, compared to 5.5% in the United States. The higher concentration in terms of service areas and subscribers by company in Canada may explain the more rapid deployment and demand for these services.

### *Internet by cable - The domain of larger enterprises*

The cable industry includes a relatively large number of participants (340 enterprises with 406 licensees), but it is highly concentrated. The industry's top five enterprises, which owned and operated 23 cable licensees, served 80% of Canadian cable subscribers. These enterprises were the first to offer high-speed Internet access by cable and accounted for 92% of subscribers to this service at the end of August 1999. For the most part, these enterprises operate cable systems in large and medium-sized cities

### *Conclusion*

The cable industry has gone through considerable change over the last decade. The introduction of several new specialty and pay channels and the entry of the industry into the Internet access service market could only be achieved by making significant improvements to existing networks. The network upgrades of the recent past and those planned for the near future, will lead to the delivery of new entertainment and information services that will be available through a personal computer or the television set.

Finally, the fundamental changes affecting the cable industry are happening at a time where there is more competition in existing audiovisual and information service markets than ever before, and this competition will more than likely extend to new markets.

#### Reference:

April, D., (2000), "Internet by Cable", *Connectedness Series*, Statistics Canada, Catalogue no. 56F0004, No.2.



## Knowledge and Innovation: Making the Most of the Best

Although all innovations enhance learning and skill levels, the complexity of innovation plays a very important part. A survey of innovation covering the three-year period 1994-96 ranks more than 2,000 firms on a knowledge-intensity scale.

Although all innovations enhance learning and skill levels, the complexity of innovation plays a very important part. A survey of innovation covering the three-year period 1994-96 ranks more than 2,000 firms on a knowledge-intensity scale.

Knowledge leads to innovation and innovation, in turn, sets in motion a new cycle of learning as firms try to find solutions to complex problems. This is the finding of a Statistics Canada study which was an invited presentation at a recent international conference on technology policy and innovation held in Brazil.

The study ranks more than 2,000 firms in the engineering services industry on a knowledge-intensity scale. Firms with a relatively large number of workers with implementation skills are ranked lower than those whose employees possess conceptual skills. The rationale is that implementation skills are associated with the ability to absorb and apply knowledge contained in manuals and work schedules, and suitable for production of standardized products in large volumes. Conceptual skills, on the other hand, enable a person to question the existing knowledge and establish new premises, perspectives and mental models to override the existing ones, and often necessary for inventions and innovations.

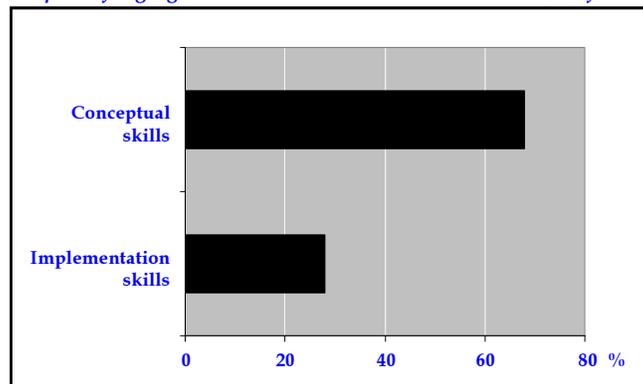
This information is then combined with the innovation patterns of firms, with innovation classified according to the degree of novelty, and whether the introduction of a new product or process of production or delivery results in upgrading or downgrading company's skill levels or leaving them or leaves them unchanged. Novelty ranged from the lowest grade representing quality improvements to the existing products to the highest grade of products and techniques not previously available.

The data, the study found that knowledge-intensive firms were more likely to innovate than firms with less knowledge capacity. However, some seemingly less knowledge-intensive firms also innovated. "On digging deeper into their knowledge management strategies, we found that they brought specialists only for specific, complex tasks because they could not afford to keep them on their payroll all year round." says Daood Hamdani, the author of the study, "This is the workforce equivalent of just-in-time inventory".

The benefits of investment in knowledge and education go beyond larger market shares and new markets. Every time a firm innovates, it triggers a new cycle of learning as workers seek solutions to hitherto unsolved problems.

Two in five innovators reported an improvement in knowledge-intensity as a result of the innovation as the employees gained insights from their research and the firm hired more highly skilled workers. While 43 per cent of the firms reported an increase in university-level skills, only half as many firms reported more demand for people with no secondary education.

*Impact of high-grade innovation on skill enhancement (% of time)*



Although all innovations enhance learning and skill levels, the complexity of innovation plays a very important part. Some 44 per cent of the firms introducing a low-grade innovation reported skill enhancement, but the figure was 53 per cent with higher-grade innovations. More striking, however, is the impact of high-grade innovation on the type of skills: 28 per cent of the firms reported an increase in implementation skill requirements while the requirement for conceptual skills was up for 68 per cent of the firms.

This information, based on the survey of innovation covering three-year period 1994-96, is being released for the first time. For details, see "Interaction between Knowledge and Innovation" which will be available on Statistics Canada's website in April.



## OECD High-level Forum on Knowledge Management The New Challenge for Firms and Organisations

An OECD forum held in Ottawa discussed the understanding of knowledge management at organization and enterprise levels across sectors in the emerging knowledge economy. Discussion revolved around 'learning' by people, by firms and by regions and 'tools' for learning, principally information and communication technologies. A summary of the forum is discussed.

### SUMMARY

#### *Introduction*

The aims of the "Organisation for Economic Cooperation and Development's (OECD) High Level Forum on Knowledge Management – The New Challenge for Firms and Organisations" were to advance the understanding of knowledge management at organisation and enterprise levels across sectors in the emerging knowledge economy and to develop a framework identifying good practices of knowledge management in enterprises and organisations across sectors. The two-day forum held September 21 and 22 in Ottawa brought together leading experts on knowledge management such as Larry Prusak, Thomas Davenport and Karl Erik Sveiby (see text box for list of presenters).

During the Forum, discussion revolved around 'learning' by people, by firms and by regions; and about 'tools' for learning, principally information and communication technologies (ICTs). The more than nine years of growth of the US economy has led Alan Greenspan to assert, in June 2000, that: "What differentiates this period from other periods in our history is the extraordinary role played by information and communication technologies." This may add support to the view that we are dealing with a 'New Economy'. An economy that uses the infrastructure furnished by the ICTs to move, process, store and display information and codified knowledge as well as to support learning, and the creation and use of knowledge at a distance.

These resources can be applied to help business or public institutions to improve what they are doing now, while still protecting intellectual property rights. The application of learning and the new infrastructure tools combined in a systematic manner with the knowledge created to do things better, may be the significant characteristics of the 'New Economy'. Of course, this idea of using information and knowledge, supported by a technological infrastructure to improve the functioning of an institution has been tried before. Management information systems are well-known examples.

The focus of managers is shifting, however, from information that can overload people, to knowledge that supports their action. Canada has had for years a two-dollar coin, on the back of which is depicted a polar bear. For the new millennium, added to the coin were the date, 2000, and the words, 'Knowledge' and 'Le Savoir'. In the centre there is no longer one bear, but three, a large

bear and two small bears. The message may be that knowledge is a capacity for action.

To generate a capacity for action, there have to be problem solvers who produce new knowledge, and problem brokers able to assemble teams to address problems in need of solutions. Before any of this can happen, the most difficult step may be finding the people able to identify problems, so that the brokers can assemble networks and the solvers can in turn solve them. A point touched upon at the Forum was that networks, and even hierarchies, are made of people and people work better with shared values, common visions, and the ability to continue to learn. Speakers reminded the Forum that even in industrialized countries there were barriers to learning, such as hunger, for poor children trying to concentrate at school. For the more affluent, an impediment is the flood of demands for attention by the very communications infrastructure that is there to facilitate learning, problem solving, and the creation of productive knowledge.

#### *Productive Knowledge and Sharing*

At the Forum there was much talk about knowledge management and little about knowledge. However the subject of the discourse appeared to be centred on 'productive knowledge' and productive knowledge, like other kinds of knowledge, grows when it is shared. This raised the important question of how to share knowledge.

There appears to be two elements to sharing. There must be trust, and there must be a means of communication. The means put forward at the Forum was the 'story'. Not just any story, but success stories told in such a way that drew in the listener. A good story, like a cartoon, lets the listener or reader fill in the gaps and become engaged. Once the person is captured by the medium, space and time no longer matter, and learning can start.

There were many other ways of sharing knowledge discussed at the Forum. To work well, there had to be a broadband infrastructure to support the sharing of image and sound. The point here was that it took more than twisted copper pairs, or even co-axial cable, to achieve the death of distance.

People, in face-to-face interaction are transferring vast amounts of information in the optical part of the electromagnetic spectrum, in addition to any audio exchange that may be taking place. This face-to-face

encounter is necessary to the building of trust. The electronic infrastructure may not be a substitute for meeting in person until the transfer rate of information is higher than is now available to consumers. However, no amount of bandwidth will replace the corridor conversation, unless, of course, this freedom is built into new electronic conference systems.

For an organization to share knowledge rapidly and effectively, it helps if its structure is flat, open, interdisciplinary, and configured to focus on a problem. The activities that are needed to make this happen are not yet well codified, or understood. Also a question of whether it was possible or even desirable to manage knowledge was raised. This led to an observation that fostering a sharing environment was the fundamental activity that would lead to more productive knowledge and its application.

At the interface with the problem, knowledge is generated. Knowledge is also transmitted and used by other actors engaged in knowledge activities and linked together for a common purpose. The generation of knowledge everywhere, and especially at the interface with the problem, was a recurring observation at the Forum that raised a question about the role of higher education.

### **Education**

Universities have demonstrated considerable flexibility over the many centuries of their existence. They are expected to continue to adapt to the New Economy by providing high quality graduates, new knowledge through research, and problem-related knowledge through consultation services offered by academics. The flatness of an organisation that is considered essential to sharing was a noted characteristic of universities. However, there remained a question about the success of multi-disciplinary teams in the discipline-oriented academic environment.

The potential for higher education in the New Economy is enormous and it is not just limited to commercialization of knowledge. A metaphor used for commercialization was a basketball game. To work, commercialization had to involve the research team, staff from the technology transfer office, and the team from the recipient firm in a series of spontaneous interactions. This differed from the linear model. Under the linear model, the researcher handed over the knowledge to the technology transfer office that in turn protected the intellectual property and licensed it to the private sector. Commercialization was perceived as a conduit for knowledge flow that included human capital. In fact knowledge flow included intellectual property and the skilled and well trained technology transfer officers, or researchers, who left the universities for positions in the private sector.

Universities, government departments, and firms were all part of a system of actors engaged in the activities of knowledge generation, transmission and use, and linked together in ever-changing networks intended to solve problems. This systems approach to knowledge opened

up discussion of the capacity to transmit knowledge (*Can the graduate student write the paper? Can the technology transfer office find a firm to license the intellectual property? Can the Professor, who embodies the knowledge, sell his or her services to commercial clients?*) and the capacity to absorb it (*Can the firm use the knowledge to create wealth, and if not, what has to be added to make this possible?*). It also raised the question of how the activities of the knowledge system can be managed to generate wealth that can be used to improve the quality of life.

### **Business**

The Forum heard of a home furnishing shop that sees its purpose as providing a better life for people. It orients its employees by using a challenging mission statement, providing a meaningful purpose and promoting shared values. It also generates wealth. Shared values recurred in a discussion of a document company that created a space for the sharing of context, and a cement company shared its knowledge by having one data base.

Other measures discussed specifically for firms, were balance sheets for intangible assets and indicators of flows of intangibles, as opposed to stocks. The emphasis was on outcomes, rather than outputs. However, if outcome data were not available, the emphasis shifted to outputs, rather than inputs. As with the other measures and means for dealing with knowledge, these were aids to managing the firm. They did not provide the aggregate information needed for industrial policy.

To understand how firms use knowledge management as part of the innovative process requires a different analytical framework from the conventional theory of the firm. If statistical offices are going to be able to report on the differences in the propensity to use knowledge management techniques in industries across the economy, then new statistical information is needed. This proposed framework would provide a map of the use of knowledge management techniques in such different industries as retail trade, offices of consulting engineers, or manufacturing of aerospace parts. The map would raise questions that are the province of government policy makers, and would generate another feedback loop in the knowledge system.

### **Government**

Participants suggested that for government departments to contribute to the New Economy, they must be prepared to open themselves to the flow of knowledge in the system. The example given was a department of industry that restructured itself to work with teams of bureaucrats, academics and business people to address problems and to make recommendations. This had all of the characteristics of an open, networked, interdisciplinary organization focused on the solution of a specific problem. It also meant that the teams dissolved and reformed as required. Government was seen as the provider of a sound framework for knowledge creation, transmission and use, anchored in shared values. It was also the provider of support, or leadership, where social benefits exceeded economic return on knowledge-

related investment. As an example, the Canadian government is developing a strategy to provide broadband access across the country. This is to support distance education, health services, and entrepreneurial activities in the business sector.

### ***Where To Next?***

More understanding is needed of the linkages in the knowledge system, of the flow of knowledge between firms, government departments, universities, and people. This flow is vital to network building. Network building is part of the problem solving which leads to new knowledge that can be shared by members of the network. The network is a stock of social capital and a facilitator of knowledge generation, transmission and use.

Hierarchies are also stores of social capital, and the more stable hierarchical structure should not be excluded from the analysis of knowledge activities. In many organisations there are functions that require a well-defined division of labour, a hierarchical reporting relationship, and quality control measures.

Together with knowledge management practitioners, official statisticians must develop taxonomies of knowledge management activities. These taxonomies require sufficiently well defined elements such that they can be used in surveys to produce aggregate statistics that can then be employed to support the policy process, and the public policy debate.

### ***Presenters in order of appearance:***

Michael Gibbons, Secretary General, Association of Commonwealth Universities  
 Bengt-Aake Lundvall, Professor, Aalborg University, Denmark  
 Alice Lam, Reader, University of Kent, England  
 Larry Prusak, Executive Director, IBM Institute for Knowledge Management, United States  
 Dominique Foray, Professor, Université Paris Dauphine, France  
 Göran Carstedt, Managing Director Global Network, Society for Organisational Learning, Sweden  
 Bill Collins, President, Ottawa Centre for Research and Innovation  
 Harry Brantz, Assistant Vice President, Holderbank, Switzerland  
 Kazue Kikawada, Corporate Knowledge Lancer, Fuji Xerox, Japan  
 Stephen Denning, Program Director of Knowledge Management, World Bank, United States  
 Sir David Watson, Director, Brighton University, England  
 Dale Shuttleworth, Executive Director, Training Renewal Foundation, Canada  
 Heather Munroe-Blum, Vice-President, University of Toronto, Canada  
 Hans Schuetze, Professor, University of British Columbia, Canada  
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 Pierre Fortier, Senior Advisor, Innovitech Inc., Canada  
 Thomas Davenport, Director, Andersen Consulting, United States  
 Martin Brooks, Senior Research Officer, National Research Council, Canada  
 Jack Smith, Project Leader, National Research Council, Canada  
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## Plugging In: the facts on household Internet use

The Internet is becoming an important fixture in Canadian households. More Canadians are becoming "plugged-in" to the Internet. These households use the Internet more often, for a longer period of time and for a wider variety of services. Despite this increasing use, there are disparities in Internet use when personal income, education, age and family type are accounted for.

### **Where?**

Accounting for use from any location (including home, work, school, and the public library), 42% of households regularly used the Internet in 1999. This was an increase in Internet penetration from 36% in 1998.

Coincident with this increase in Internet use was an increase in Internet Use from home. The proportion of households that accessed the Internet from home rose from 16% in 1997 to 29% in 1999. This marked the first time Internet use from home surpassed the proportion of households that accessed the Internet from work.

### **How Often?**

Of the home-use Internet users, nearly two-thirds accessed the Internet every day. More than two thirds of Internet households spent at least ten hours a month using the Internet and nearly half used the Internet for at least twenty hours.

### **Why?**

While almost all home-use Internet users used the Internet for personal, non-business use, about one-fifth (19%) used the Internet for self-employment purposes and one quarter used it for employer related reasons.

### **For What?**

The overwhelming majority (92%) of home-use households use e-mail. These households also used the Internet to find medical and health information (54%), government information (44%) and other specific information (85%). Nearly one in five households used the Internet for purchasing goods and services.

### **Household Income and Internet Use**

Higher incomes = higher use. When the households were grouped by income levels, the highest income group was five times more likely to be Internet users than the lowest. Internet use rose for all income groups between 1998 and 1999. However, the penetration rate rose higher for higher income households than in lower income households.

Cost is not necessarily the critical factor in a household's decision to access the Internet. Of the households that had a home computer, about one quarter of households that did not use the Internet cited cost as a reason. This is less than the percentage that saw no use from home or did not find it useful to do so (29%).

### **Personal Education and Internet Use**

Higher educated households use Internet more. Households where the head of the household had a university degree were four times more likely to use the Internet than those in which the head did not complete high school. Between 1998 and 1999, the proportion of households that accessed the Internet increased for all education categories. The advance, however, was strongest in households in the lowest education category.

### **Internet Use rising for all age categories**

The penetration rate rose for all age groups between 1998 and 1999. More than half of all households where the head of the household was under 55 used the Internet in 1999. Where the head was between 55 and 64, almost one-third used the Internet (32%). Among households where the head of the households was 65 or older, the penetration rate was 10.1%.

### **All family types becoming connected**

Among different family types, Internet use was highest for single family households with children (59%). For single family households with no children, 39% used the Internet. Families with children had a higher rate of Internet use in schools (30%) than those without (9%). However, Internet use from home was also higher for families with children (41%) than those without (28%).

Multi-family households had the second highest penetration rate (53%) but represent only 4% of households. Only about one fifth of one-person households use the Internet.

### **Conclusion**

Obviously, there are no reasons to expect anything but increased use of the Internet as Canadians increasingly continue to "plug-in".

Further information: Greg Peterson, Chief, Electronic Commerce Section, SIEID, Statistics Canada,  
(613) 951-3592, [Greg.Peterson@statcan.ca](mailto:Greg.Peterson@statcan.ca)



## Canadian Telecom – Wireless or bust

Despite strong growth in the Canadian telecommunications wireless sector, it is not taking over. A comprehensive quarterly survey of telecommunications service providers presents interesting observations.

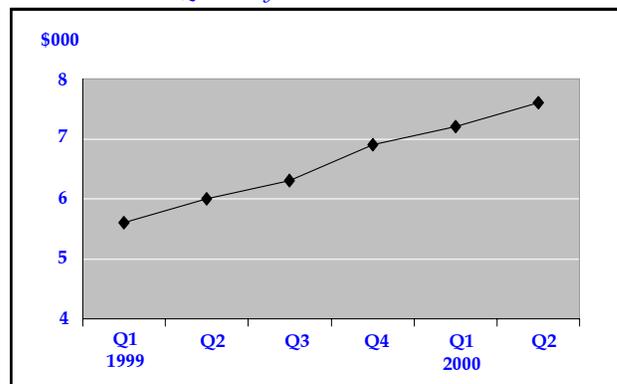
From cell phones to microwave communications, telecomm-unications are making waves in Canada and around the world. According to Statistics Canada's Quarterly Survey of Telecommunications Service Providers, the Canadian industry reported \$7.5 billion in operating revenues in the second quarter of 2000, with an operating profit of 16 cents on each revenue dollar.

The wireless sector continues to show remarkably strong growth in subscribers. Second quarter mobile subscribers were up more than twenty-eight percent from the same period in 1999, and this stellar performance shows no sign of slowing down. Despite all this, wireless is not taking over. Haig McCarrell, Chief of the Telecommunications section at Statistics Canada noted that, "Judging by the continued growth in fixed-line access, it seems consumers still consider mobile telephony as a complement to, rather than a substitute for, their wireline access." Voice-grade wireline access reached 20.6 million lines in the second quarter of 2000, up five percent from the same period in 1999. (Voice-grade: A voice-grade access line transmits voice or data at 64 kbps. They also transmit communications in an audio frequency range between 300 and 3000 Hz, typical of the human voice).

Increases in mobile access however did not translate positively to the wireless sector's bottom line. There were operating losses reported from the second quarter of 1999 to the first quarter of 2000. This undoubtedly reflects the steep roll-out costs for new services and for establishing each service provider's presence in a highly dynamic and competitive market. Things may be changing now, with the industry reporting an operating profit of about 3 cents per revenue dollar at the end of second quarter, 2000.

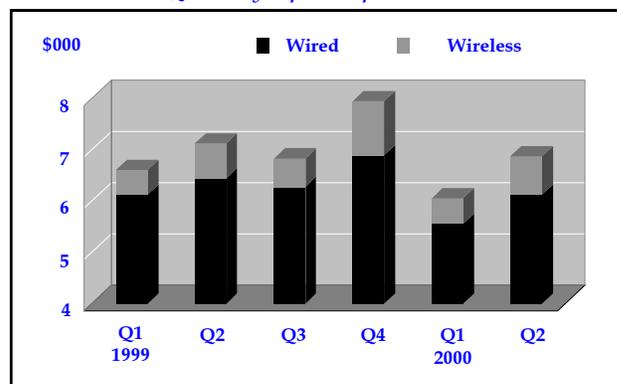
In keeping with new technologies and the presence of new licensees, high capital expenditures (construction, machinery and equipment) have been characteristic of the telecommunications industry. Capital expenditures rose during the first half of 1999, and skyrocketed in that year's fourth quarter to over \$1.9 billion. Expenditures came back down to earth in the first quarter of 2000, leading some to muse whether the big infrastructure build-out was coming to an end. The second quarter has shown that it is too early to make such a prognosis, as spending was an impressive \$1.4 billion.

Quarterly cellular subscribers



"We introduced a comprehensive survey of this sector on a quarterly basis," commented Mr. McCarrell, "so telecom industry watchers could have timely data that will help them make informed decisions." The interest expressed in this industry seems to have warranted the effort put into developing this survey and the co-operation of the industry in participating in it.

Quarterly capital expenditures



**NOTE TO READER** - The telecom industries: There are five telecommunications industries in the North American Industry Classification System (NAICS): wire, wireless, satellite, reseller, and other. The first three industries are facilities-based carriers that operate and maintain switching and transmission facilities via land lines, air waves and satellites respectively (sometimes using a combination of technologies). Resellers do not own transmission facilities but purchase network capacity and resell these services.

The satellite industry includes satellite resellers. The 'other' industry covers all establishments not elsewhere specified (e.g., telemetry, radar stations operations, satellite tracking, etc.). For further information, consult Statistics Canada publication 12-501-XPE, issue number 97001.

The wired (wireline) industry comprises establishments primarily engaged in operating and maintaining switching and transmission facilities to provide direct communications via land lines, microwave, or a combination of land lines, microwave and satellite link-ups.

The wireless telecommunications industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide direct communications via the airwaves, including cellular, personal communications services (PCS), enhanced specialized mobile radio (ESMR), and messaging (paging).

A telecommunications service provider is a reseller if it is primarily engaged in purchasing access and network capacity from owners and operators of telecommunications networks and reselling telecommunications services to their clients.

The satellite industry comprises establishments primarily engaged in operating, maintaining and providing access to fixed and mobile satellite telecommunications facilities for the transmission of voice, data, text, sound and full motion videos. Resellers of satellite communications are also included.

The 'Other telecommunications' industry includes companies providing telecommunications services not covered by the industries described above (e.g., telemetry, satellite tracking, radar stations operations).

Further information: Haig McCarrell, Chief, Telecommunications, SIEID, Statistics Canada,  
(613) 951-5948 Haig.McCarrell@statcan.ca

or

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(613) 951-1891, Heidi.Ertl@statcan.ca



## Update on IP Commercialization

*Comparison of Resources Dedicated to IP Management*

	<b>Units</b>	<b>Federal Departments</b>	<b>Universities</b>
Employees dedicated to IP management	FTE (full-time equivalent)	66	169
Salaries	\$ thousands	4,867	10,008
Patent application expenditures	\$ thousands	1,625	5,679
Legal costs	\$ thousands	569	1,499
Other operational expenditures	\$ thousands	1,450	3,843
Total operational expenditures for IP management	\$ thousands	8,511	21,029

In the last issue of the Innovation Analysis Bulletin (Vol. 2, No.3) preliminary figures were presented that compared intellectual property commercialization activities in federal government departments and universities. These figures have been revised and are presented in more detail in Table 1.

Only the figures for the federal science based departments required revision. They now include one correction and an estimate for one department that reported full-time equivalents (FTEs) but no corresponding salary budget.

Further information: Michael Bordt, Chief, Knowledge Indicators Section, SIEID, Statistics Canada,  
(613) 951-8585, Michael.Bordt@statcan.ca



## Meeting of Users and Provincial Providers of Science and Technology Statistics

On December 8 last, the Quebec Institute of Statistics hosted a forum for Statistics Canada and provincial government experts dealing with the subject of science and technology statistics.

Held following a similar gathering in Toronto on October 4 and 5, 1999, this forum provided an exchange of information on the activities of the provinces and Statistics Canada with respect to S&T statistics. There

was also a discussion about the problems and difficulties of collecting and using S&T statistics.

Interesting points were raised about the concepts of science literacy, high-tech commerce and social capital in terms of networking. Participants agreed that further efforts were needed to improve data timeliness and increase data sharing.

Further information: Antoine Rose, Product Development Officer, Biotechnology, SIEID, Statistics Canada,  
(613) 951-9919, Antoine.Rose@statcan.ca

## What's new?

### *Recent and upcoming events in innovation analysis.*

#### SCIENCE AND INNOVATION

##### S&T Activities

##### Federal and provincial S&T

##### Federal science expenditures

Status: A service bulletin, Science Statistics, *Cat. No. 88-001, volume 25, no. 1, covering regional federal government expenditures was released. Federal Scientific Activities, Cat. No 88-204 will be released in February 2001.*

Contact: Bert Plaus (613) 951-6347

[Bert.Plaus@statcan.ca](mailto:Bert.Plaus@statcan.ca)

or: Janet Thompson (613) 951-2580

[Janet.Thompson@statcan.ca](mailto:Janet.Thompson@statcan.ca)

##### Industrial R&D

##### Research and development in Canadian industry

Status: The annual report 88-202 was released in January 2001.

Contact: Bert Plaus (613) 951-6347

[Bert.Plaus@statcan.ca](mailto:Bert.Plaus@statcan.ca)

#### Human Resources and Intellectual Property

##### The higher education sector

##### Intellectual Property Commercialization in the Higher Education Sector

Status: We are in the process of reviewing the questionnaire. A survey is planned for the fall of 2001.

Contact: Cathy Read (613) 951-3838

[Cathy.Read@statcan.ca](mailto:Cathy.Read@statcan.ca)

##### Federal intellectual property management

##### Federal Science Expenditures and Personnel 1999-2000, Intellectual Property Management, Fiscal Year 1998/99

Status: We are in the process of reviewing the questionnaire. A survey is planned for the fall of 2001.

Contact: Claire Simard (613) 951-1916

[Claire.Simard@statcan.ca](mailto:Claire.Simard@statcan.ca)

##### Human resources in science and technology

Contact: Michael Bordt (613) 951-8585

[Michael.Bordt@statcan.ca](mailto:Michael.Bordt@statcan.ca)

#### Advanced Technologies

##### Innovation and advanced technologies and practices in the construction and related industries

Status: A working paper and a research paper on this topic will be available in February 2001.

Contact: Frances Anderson (613) 951-6307

[Frances.Anderson@statcan.ca](mailto:Frances.Anderson@statcan.ca)

##### Advanced technologies in natural resource industries

Status: This survey is under development.

Contact: Frances Anderson (613) 951-6307

[Frances.Anderson@statcan.ca](mailto:Frances.Anderson@statcan.ca)

#### Innovation

##### Innovation in manufacturing

Status: Tables, containing the data from the «1999 Survey of Innovation», at the national level, for manufacturing, have been completed and delivered to the client. A similar set of tables containing data for selected natural resource industries will be completed by the end of February 2001. Working papers prepared from these tables are planned for completion by the end of the fiscal year.

Contact: Brian Nemes (613) 951-2530

[Brian.Nemes@statcan.ca](mailto:Brian.Nemes@statcan.ca)

##### Innovation in services

Status: A report, «Capacity to Innovate, Innovation and Impact» will be released in March 2001. A paper, «Interaction between Knowledge and Innovation» will be released in April 2001.

Contact: Daood Hamdani (613) 951-3490

[Daood.Hamdani@statcan.ca](mailto:Daood.Hamdani@statcan.ca)

#### Biotechnology

##### Federal S&T expenditures

Status: A service bulletin will be released in February 2001.

Contact: Antoine Rose (613) 951-9919

[Antoine.Rose@statcan.ca](mailto:Antoine.Rose@statcan.ca)

## CONNECTEDNESS

A new series, the Connectedness Series, was launched in November 2000. The first paper, entitled «*Plugging In: The Increase of Household Internet Use Continues into 1999*» provides updated information on Internet use by households on numerous variables.

A second paper, entitled «*Internet by Cable*» has also been released. It examines the provision of Internet services over the networks operated by companies in the cable industry.

The series can be accessed freely at:

<http://www.statcan.ca:80/english/freepub/56F0003XIE/products.htm>

[http://www.statcan.ca:80/francais/freepub/56F0003XIF/products\\_f.htm](http://www.statcan.ca:80/francais/freepub/56F0003XIF/products_f.htm)

Co-ordinator: *George Sciadas (613) 951-6389*  
[George.Sciadas@statcan.ca](mailto:George.Sciadas@statcan.ca)

## Telecommunications

### Annual survey of telecommunications service providers

Status: The 1999 annual survey is currently in the field being collected. The 2000 survey will be mailed to respondents in March 2001. The 1998 annual publication, «*Telecommunications in Canada*», Cat. No. 56-203, featuring an article on industry supplier (incumbents, entrants, cellcos, etc.) market shares and performance is now available from our website, [www.statcan.ca](http://www.statcan.ca).

### Quarterly survey of telecommunications service providers

Status: Second quarter statistics for 2000, Cat. no. 56-002-XIE has been released and the third quarter bulletin is scheduled for release in February.

Contact: *Haig McCarrell (613) 951-5948*  
[Haig.McCarrell@statcan.ca](mailto:Haig.McCarrell@statcan.ca)

## Broadcasting

Contact: *Daniel April (613) 951-3177*  
[Daniel.April@statcan.ca](mailto:Daniel.April@statcan.ca)

## E-commerce

Contact: *Greg Peterson (613) 951-3592*  
[Greg.Peterson@statcan.ca](mailto:Greg.Peterson@statcan.ca)

## OTHER

### Eurostat

Eurostat is the statistical office of the European Union and it funds and co-ordinates surveys conducted by member countries.

In autumn 2000, the Working Party on R&D and Innovation Statistics met to review the questionnaire for the third round of the Community Innovation Survey (CIS). It is expected to be in the field in 2001 for the reference period 1998-2000, with the objective of providing data on innovation activities comparable across the 15 EU member countries. This will build on work done on the first and second round of the CIS.

The working Party for the Information Society met to discuss the first pilot survey of electronic commerce and the plan is to collect data from all EU countries but for France and Belgium, for reference year 2000, including the value of electronic sales, where possible. Eurostat works closely with the OECD on electronic commerce.

## OECD

In April, the Working Group on Indicators for the Information Society (WPIIS) met jointly with Working Group on the Information Economy (WPIE) and agreed upon a broad and a narrow definition of electronic commerce transactions, and a set of business and household indicators, which were made public in September. Since then, a group of experts has met to review the definitions and to make recommendations about what is included and what is excluded from them. These recommendations will go to the next meeting of WPIIS in April 2001.

In September, the OECD held a High-Level Forum on Knowledge Management in Ottawa. This was one in a series of such meetings that has given rise to the best selling OECD publication «*Knowledge Management in the Learning Society*» released earlier this year. The Forum examined the practice of knowledge management in business, higher education and in public institutions. The next in the series will be in Copenhagen in February 2001 and the next research workshop of SIEID will focus on knowledge management in the firm as part of the innovative process. That will take place on February 23, 2001 in Ottawa.

## Policy Research Initiative

The Policy Research Initiative provides substantial funding for the work of the SIEID and the division contributed to the Statistical Day prior to the national conference in Ottawa on November 30 and December 1, 2000. There were presentations on the international aspects of research and development statistics and on both the household Internet use survey and the business survey on electronic commerce and the use of information and communication technologies. A paper, «*The Canadian Landscape of E-Commerce*» contributed to the main conference.

