Developing a user-centric statistical program – The Canadian experience with the Information Society Statistics Program

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Introduction

Canadian legislation gives Statistics Canada a comprehensive mandate to statistically describe the social and economic fabric of Canada and Canadians invest significant resources into their statistical agency to fulfill that mandate. Still, the need for information consistently exceeds the means of the agency to produce information.

Statistics Canada's resources support its core programs, essentially those required by legislation and those necessary to produce basic economic and social accounts. More often than not, addressing new issues requires the engagement of the user community. In addition to providing the necessary financial resources, partnerships with users allow the statistical system to establish priorities, define needs and develop the knowledge networks required to build new statistical infrastructure and outputs.

The Canadian Information Society Statistics Program (ISSP) is a case in point. From its beginning in the mid-90s, the program has relied to a large extent on the sponsorship of the user community. It started as a 5-year partnership between Statistics Canada and Industry Canada[2] "to develop the statistical and analytical infrastructure required to understand the information society", a partnership renewed over time to add new partners, address new issues and further develop statistics and analysis.

The original goal of the ISSP has been met through the creation of new knowledge on major economic and societal developments related to the information society and by the use of this knowledge to inform policy at the federal, provincial and international levels[3]. For instance, much of what is known today about the prevalence and diffusion of Internet applications across the Canadian society and economy, the nature and extent of the digital divide, the evolution of the Canadian information society compared to that of other countries, and the impact of information and communication technologies and related policies on our society can be attributed to this program. Of equal importance, the program has afforded opportunities for the statistical, policy and academic communities to engage in joint analytical projects that add value to basic indicators.

The conference "Statistics - Investment in the future 2" states as one of its objectives "the exchange of findings, observations and experiences in the provision of statistics for fulfilling user's needs". This paper's contribution is to share the Canadian experience in developing and implementing the Information Society Statistics Program, very much a user-centric statistical program. It does so by describing the context in which the program was born and how it was built over time with the help of users and partners, by providing examples of how and by whom its statistical and analytical outputs are used, and by sharing some of the lessons learned along the way. As well, it highlights the two-way linkages between domestic and international work, particularly at the Organisation for Economic Co-operation and Development (OECD) and the United Nations (UN). Finally, it offers some thoughts on how the Information Society Statistics Program could evolve to enhance its return on investment in years to come.

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[1] This paper borrows information from unpublished memoranda of understanding, briefing notes and presentations to which many colleagues, past and present, have contributed. The author wishes to acknowledge and thank his colleagues for their contributions. The opinions expressed here, however, are those of the author.

[2] The department responsible for industrial policy, including policies related to the development of information and communication technologies in general, and of e-commerce in particular.

[3] This paper does not attempt to summarize the many findings of the program through the years. The reference section does, however, provide a listing of relevant papers and hyperlinks to metadata for readers interested in finding out more about the outputs of the Canadian Information Society Statistics Program.

The beginning of the Canadian Information Society Statistics Program

The belief that information and communication technologies (ICTs), in particular the Internet, would fundamentally transform business practices, individual behaviours and government policies was prevalent in the first half of the 1990s. There were expressions of optimism and concern: optimism about the creation of wealth through innovation and improved productivity; concern about employment, privacy and universal access to the benefits of the information society. The awareness of these issues intensified as the Internet became more widely available and used.

At that time, much discussion and analysis took place in the absence of a statistical system. There were some useful statistics of course, but the lack of a coherent framework into which those statistics could be organized and analyzed and the many information gaps – especially on the use of ICTs - made research and analysis very challenging. For example, although there was much talk about the growing contribution of the information and communications technologies sector to the economy, there was no common understanding of which industries it included.

The first attempts by the statistical system to help inform discussions by quantifying the information society were launched in the mid-1990s. In Canada, the project involved the statistical agency and interested policy departments[4]. A similar project was undertaken at about the same time by the OECD within its Global Information Infrastructure/Global Information Society (GII/GIS) initiative.

The results of the Canadian project were presented in September 1996 in a report titled "Measuring the Global Information Infrastructure for a Global Information Society – Concepts and Performance Indicators" (GII/GIS report). The report organized available statistics to paint a picture of the Canadian information society, identified the most important data gaps and made a number of recommendations for future statistical work.

The GII/GIS report was an important step towards the launch of the ISSP. Looking back, the report's main legacy was its unequivocal endorsement for partnerships between users and suppliers of data to develop the statistical system and for international harmonization of relevant statistics. The main recommendation read:

> "Policy makers must work closely with statistical agencies to ensure that statistical frameworks and data collection programs remain relevant and timely, keeping pace with changes in the industries they measure. New ones need to be devised when required so that a set of performance indicators can be developed to quantify the impact of economic, social and cultural policies.
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> If policy makers are to understand the intricacies of the information economy, there is a case for developing a set of indicators of economic, social and technological characteristics that are so isolated from one another, but that can be brought together to provide one coherent picture. This is the most significant challenge for future work which, to some extent, is being addressed through OECD research on GII-GIS. It is therefore recommended that definitions and indicators for the GII-GIS be developed as policy issues are identified, as the two are interdependent".

Building an Information Society Statistical Program from the ground up was challenging, but the information was deemed essential to support the development of a useful regulatory framework and of related economic, social and science and technology policies. Meeting the challenge required the setting of priorities and the development of an action-based strategy. Both were very much influenced by the users.

The priorities established at that time were:

- To make better use of existing information by developing standards that would promote a more coherent use of those statistics;
- To improve existing supply-side measures of information and communication technologies and products, in particular those related to the supply of telecommunication services;
- To develop and implement measures of ICT use by households, businesses and institutions;
- To develop a dissemination strategy and dissemination vehicles that would make the knowledge gained through the program available to as wide an audience as possible.

[4] The departments of Finance, Heritage and Industry.

The basic elements of the strategy were:

- To involve both users and suppliers of data in the development of the program. This would ensure that the information met the needs of users and that information could be collected.
- To contribute to, and learn from, similar initiatives in other countries and international organizations. This would ensure international benchmarking of Canadian progress towards becoming an Information Society.
- To involve data users in the financing of the new program. This would ensure the sustainability of the program and also would foster an environment conducive to keeping the program up-to-date.

More than a decade later, the legacy of the GII/GIS report lives on. Much of what has been achieved to describe the Canadian information society in statistical terms - and begin assessing its socio-economic impacts based on statistical analysis - is the result of the collaboration between the statistical and policy communities, both domestically and internationally. The future of the program in Canada depends very much on keeping that partnership alive.

The GII/GIS report was instrumental in articulating the need for an ISSP, but not sufficient to ensure its sustainability. Those involved in the project had to put in place the conditions to build a successful long term partnership between users and suppliers of statistics. The approach, built over time, is articulated around two pillars:

1. Establishing a strong link between the policy agenda and statistical developments;
2. Developing mechanisms to make the partnership work.

The following sections of the paper describe how they were built.

The policy agenda and statistical developments

In Canada, the development of a new statistical program is almost impossible without a mandate and financial support from a policy user, and such mandates typically entail a strong policy agenda and a belief by the policy community of the importance of evidence-based policy development and monitoring. Those conditions developed in the mid-1990s around a set policies aimed at connecting Canadians to the Internet.

The second report of the Information Highway Advisory Council (IHAC, 1997) identified three priority areas of public policy concerns, all centered on access to networks and services, and in doing so helped shape public policy and statistical priorities at that time. Two closely related policy actions followed, both contributing to setting the stage for the ISSP.

The first policy action was the 1997 Speech of the Throne[5] in which the government of the day made a commitment to "make the information and knowledge infrastructure accessible to all Canadians by the year 2000, thereby making Canada the most connected nation in the world." That policy objective was supported by *a* policy framework articulated around six pillars or goals, the so-called "Connecting Canadians Agenda":

- **Canada On-Line** – The goal was to help connect Canadians to each other and the world. Several programs were elaborated to facilitate access to the Internet in public institutions and communities and to improve the Internet infrastructure.
- **Smart Communities**: The goal was to foster the development of Smart Communities across the country, a smart community being one able to make the most of the opportunities that new ICTs afford — for better health care delivery, for better education and training, and for growing businesses. Awareness and skill development programs were developed to achieve this objective.
- **Electronic Commerce** – The goal was to encourage the development of electronic commerce in order to realize its potential for increased trade and investment and for the creation of high-quality jobs. Several programs were elaborated to facilitate the deployment of e-commerce and to foster acceptance by individuals, businesses and institutions.
- **Governments On-Line**: The goal was to enable Canadian citizens and businesses to access all government information and services on-line at the time and place of their choosing and build trust and confidence in on-line transactions.
- **Content On-Line**: The goal was to make Canada a world leader in supplying online content as

[5] The Speech of the Throne is the process by which the government announces its priorities at the start of a new session of its federal legislature, known in Canada as the House of Commons.

well as software and applications. Several programs were elaborated to facilitate the digitization of cultural and informational products and the development of applications for the Internet.

- **Connecting Canada to the World**: The goal was to leverage the telecommunications infrastructure to attract foreign investment.

The second policy event was the OECD Ministerial Conference on Electronic Commerce held in Ottawa in October 1998. The conference adopted an action plan for OECD activities, among them specific measurement activities. In particular, the OECD was asked to "continue work to improve the ability to measure the structure and volume of electronic commerce and to deepen our understanding of the impact of electronic commerce within and between businesses". Information society statistics in OECD countries and elsewhere were largely developed following this event.

These events were instrumental in setting the stage for the ISSP in that they set clear policy monitoring objectives, and in so doing made the task of developing the necessary indicators a priority for the statistical system.

At the outset, the ISSP was designed to support the Connecting Canadians agenda, first through the development of standards and analytical work based on existing information, then through the development of new measures of access to, and use of, ICTs by businesses, institutions and citizens. Other policies helped shaped the ISSP early on, most notably policies to open selected telecommunication services markets to competition.

The early emphasis was placed on the development of so-called indicators of readiness to use, intensity of use, and volume of e-commerce[6]. The statistical and analytical program built then to serve that purpose remains the foundation of today's program. Its main components are:

- A survey of Internet use by households and individuals;
- A survey of ICT use by businesses and institutions;
- A quarterly and an annual survey of telecommunication services providers;
- An analytical program that uses several outlets to reach diverse audiences.

Although the policy context of the late 1990s largely defined the original statistical program, its durability has been a function of its ability to respond to evolving policies and information needs. The program has been called upon to inform a variety of policy issues, including those related to e-commerce, e-government and service transformation initiatives, the digital divide in both the people and business dimensions, the Internet as a tool for social cohesion, privacy and security concerns as they relate to the Internet, the Internet as a tool to facilitate the delivery of health information and health services, universal access to broadband services, the advancement of e-business as a tool to improve productivity and competitiveness, and competition in telecommunications markets. The ability of the statistical program to adapt has played an important role in both its successes and deficiencies. The next section provides a few examples of how the statistical system has accommodated changing needs.

Adapting to changing needs

There are a number of ways for the statistical system to adapt to new needs: it can add value to existing information; it can develop, update or redesign existing surveys; it can focus its analytical work on priority policy issues. All approaches have been used to inform information society related policies.

In an effort to add relevance to the existing data, early efforts focused on the development of standards to present basic economic indicators in a useful way. The first measures of the ICT sector's production (GDP), employment, revenues, profits, assets and research and development expenditures were designed in that manner, as were measures of trade in ICT goods and services. Standardization efforts of this type later moved from the domestic to the international stage; the standards developed by the OECD to define ICT industries and products have become widely used and accepted. Several years later, these basic indicators continue to inform policy; for instance, the Canadian department responsible for industry (Industry Canada) maintains a web publication largely dedicated to this type of information[7].

[6] These concepts are well documented in the OECD Guide to Measuring the Information Society
[7] Canadian ICT Statistical Overview (ICTSO)

Good use was also made of the household penetration statistics available from the Canadian Household Facilities Survey. The Survey provided information on the penetration of telephones, cable television, computers and modems, cellular phones and Internet use. The socio-economic variables of the survey supported early investigations of the determinants of Internet use.

But the key to meeting user needs has been the development of new survey instruments and their renewal through time to maintain relevance. This has provided necessary indicators and the raw material for new research and analysis.

The *Canadian Household Internet Use Survey* (HIUS) – a large scale survey that measures various aspects of Internet connectivity and use by household – was launched in 1997 and has since been updated several times to address changing needs. It was conducted annually from 1997 to 2003 as a household survey before being transformed into a survey of individuals in 2005 after soliciting and testing new questions supplied by a consortium of users. It then became known as the *Canadian Internet Use Survey* (CIUS). In 2007, the target population of the survey was extended to include persons 16 and 17 years of age, conforming to international standards for this type of survey. The biennial survey will be conducted again in November of 2009.

Early on, the main focus of the survey was on measuring the penetration of the Internet. The policy interest gradually shifted from connecting Canadians, to promoting the availability and use of broadband Internet, to understanding the nature and extent of use of the Internet by individuals and how it is affecting their lives. The survey evolved with each shift in policy interest. For example, measures of on-line purchases, privacy and security concerns, broadband take-up and specific uses of the Internet (e-health, e-education, e-government) were added at different points in time. So were profiles of Internet users based on language and ethnic origin to inform cultural and social cohesion related issues.

For most policy users however, the interest for the CIUS program goes beyond the specific questions that inform policies for which they have responsibility. The value of the statistical program also lies in its ability to build socio-economic profiles of Internet users and non-users and to probe into the outcomes of Internet use. For example, the department that oversees the e-government and service transformation initiatives across the Government of Canada is interested in, and has sponsored, survey questions that help track how Canadians are using the Internet to interact with their governments; they are equally interested in the behaviour of different groups on the Internet and how that behaviour evolves through time. This knowledge supports the development of strategies to increase the effective usage of the on-line channel for government information and services.

For the purpose of developing profiles, the challenge of remaining relevant has been met by engaging in germane analysis, often in collaboration with users. The CIUS and related surveys of households and individuals have supported, individually and together, a rich research agenda dealing with a wide variety of issues including online activities of Canadian boomers and seniors, Internet usage patterns in broadband households, the impact of the Internet on social life and civic participation, profiles of Internet drop outs, the digital divide including the rural-urban divide, profiles of top online spenders, the effects of the Internet on the consumption of traditional media and on time use, and the relationships between adult literacy skills and use of information and communications technologies (ICTs). The rich research agenda was made possible by the access to a fully integrated suite of socio-economic variables (age, sex, income, family composition, education and geography).

The *Survey of Electronic Commerce and Technology (SECT)* - an economy-wide annual survey which reports on the use and application of ICTs by Canadian businesses and institutions - was designed at the outset to enable research on an emerging policy issue each year through a module reserved for that purpose. The module has looked into issues such as information sharing over electronic networks; technology transfer from universities, research hospitals and federal laboratories; organizational change and innovation in the public sector; and the use of innovative management practices. For the latest survey cycle in 2007, the module probed into the use of Internet-based systems to manage selected logistics and customer relations activities as well as the level of integration of these e-business systems with other systems within the organization and along the supply-chain. The data collected by this module through time has provided a timely response to inform science and technology related policies or e-commerce related policies.

The core data from the SECT have been used to monitor the adoption of selected technologies, the growth in the volume of e-commerce, the relative size of B-to-B and B-to-C commerce and the volume of e-sales to non-residents. Early on, these were perceived as useful indicators of the uptake of ICT applications, in particular e-commerce, and of its impact on trade. These indicators are still considered relevant, as e-commerce is believed to be at an early stage of development. The relatively large survey sample permits analysis by sector and firm size; this analysis has informed the development of e-commerce strategies by sector as well as initiatives targeting small businesses.

The core modules of the SECT have seen little change over time. A few questions have been added to track new phenomenon, for example the use of radio frequency identification (RFID) and open source software. A few questions have been removed as they became less relevant, for example the use of computers and barriers to e-commerce. A few questions have been refined to reflect changing technologies, for example the list of functions supported by the responding organization's web site. These changes were initiated by the main user, the government department that oversees the country's e-commerce and related policies.

In an effort to enhance the analytical value of the program, a longitudinal researcher data base was developed. The data base contains records from the SECT for firms that responded to 3 consecutive cycles of the survey. It was hoped such a data base would support research aimed at understanding the process of integrating ICTs into organizations of different size and different sectors. The tool has been used only sporadically, probably because its usefulness is limited by the lack of access to firm performance data. Thus, it has not yet provided a significant return on investment.

The inability of the program to support studies of the impact of ICT use on firm performance has been its most significant weakness. Contrary to the CIUS, the SECT program does not have a built in data integration feature giving it access to the performance or characteristics data necessary for such analysis. A first step was taken to address that issue by linking the results of SECT to those of an innovation survey in support of an OECD sponsored study looking at ICT enabled innovation.

The *Annual and Quarterly Surveys of Telecommunications* – designed to measure the financial performance and economic contribution of the telecommunications services sector, the level of competition in its markets and the use of the telecommunications infrastructure - have been redesigned twice in the span of a decade to adapt to changing industry and market structures, and to provide the necessary data to develop and monitor related policies.

The latest version of the annual survey was not only developed in collaboration with its main user (the regulator), it is now conducted in partnership with that user. The integrated data collection replaced three existing surveys (two previously conducted by the statistical agency and one by the regulator). In addition to meeting the needs of the regulator and the statistical system with a single survey instrument, the joint collection promotes improved coherence of the statistical system and reduces the burden on respondents.

The new survey program, among other improvements, now collects more relevant product (market) information to monitor competition policy and more detailed geographic information on broadband deployment to help monitor broadband availability in rural communities. The surveys, past and present, have informed other policy initiatives, such as changes in price regulation and spectrum allocation, and supported assessments of the impact on the industry of these policy decisions. There is also further work to be done in response to a panel report to the government concerning the review of the telecommunications policy.

The findings of the survey as they apply to the monitoring of policy and the application of regulations are published annually in the regulator's communication monitoring report. Users also benefit from the integration of selected data from these surveys into various components of the System of National Accounts, including input-output tables, the income and expenditure accounts and price statistics. These accounts provide basic economic indicators within a coherent system and underlie relevant macroeconomic analysis pertaining to the sector.
The paper has so far attempted to illustrate the importance of the policy agenda for statistical developments and to provide examples of how the statistical system has accommodated changing needs through time. This is an on-going process that will continue as new policy and data needs emerge. More recent policy initiatives, domestic and international, are already having an influence on

the statistical system. They will be addressed at the end of the paper in the discussion of the future of the information society statistical program.

The institutional setting and the mechanisms developed to maintain a strong link between policy and statistics have also been a key to the durability of the information society statistics program. The next section describes the model adopted.

An approach to implementing a partnership between users and suppliers of statistics

Two measures have played a crucial role in maintaining the relevance of the Information Society Statistical Program, and in doing so, the durability of the partnership with its users:

- The building, and supporting, of communities of interest and of practice;
- The signing of Memoranda of Understanding (MOU) and the tabling of reports on the outputs of the statistical program.

Communities of interest and of practice have been instrumental in the process of staying informed of policy issues, acquiring and creating new knowledge, leveraging and standardizing best practices and ultimately, building and maintaining statistical capacity.

In the early days of the program, an advisory committee was formed to play that role. The committee had representation from policy departments, the telecommunication regulatory agency and the academic, research and business communities. The contribution of the committee went well beyond providing advice; its members were actively engaged in the background work that led to the redesign of the telecommunication statistics program and in the early analytical work that informed on the state of the Canadian Information Society. Perhaps more importantly, it gave the statistical agency a network of knowledgeable users that contributed to the statistical program well after the end the committee's mandate.

Later on, a consortium of funding users (known as the CIUS consortium) assumed a similar role. In addition to providing a round-table for on-going discussions of user needs and their integration into the program, the consortium established an interaction that has facilitated the sharing of knowledge, provided opportunities to engage in joint analytical projects and afforded much needed financial resources. The consortium includes the five main federal policy users.

Community building has also been fostered through various outreach activities where users and suppliers of statistics meet. In the last year alone, project team members have organized meetings with close to twenty federal and provincial departments and agencies and have participated in numerous workshops and conferences to demonstrate the program's analytical potential. For instance, the Information Society Statistics Program made contributions to two sessions at Statistics Canada's 2009 Socio-economic Conference: a study of the influence of community size on Internet use was presented at a session on rural economy and infrastructures; three studies were discussed at a session devoted to the topic of Internet use and impacts[8]. The conference provides an occasion to present studies that shed light on Canadian public policy issues and promotes empirical studies making innovative use of data. The information society agenda has been prevalent for several years at the conference[9].

The communities of practice extend beyond domestic boundaries. Participation in OECD working parties in particular has had, by design, a significant influence on the Canadian statistical system. Statistics Canada and Industry Canada have been, and remain, active within the Working Party on Indicators for the Information Society (WPIIS). Canada has occupied a chair on the Bureau of the WPIIS since its inception and contributes to working parties involved in related policy development and analysis, notably the Working Parties on the Information Economy (WPIE), on Information

[8] Broadband-ICT-Use-Productivity Project, Hans-Olof Hagén, Statistics Sweden; Internet Shopping in Canada: Trends and Patterns, Larry McKeown, Statistics Canada and Josie Brocca, Industry Canada; La mise en œuvre des processus d'affaires électroniques au Canada, Sylvain Ouellet, Statistics Canada.

[9] Many of the papers presented over the years were authored or co-authored by partners from policy departments (Industry Canada, Canadian Heritage, Treasury Board Secretariat) and the academic community (Ryerson University, University of Ottawa, University of Toronto, University of Waterloo).

Security and Privacy (WPISP) and on Communications and Infrastructures and Services Policy (CISP). Interestingly, Canada's involvement in those working parties has played a role in strengthening the ties between the Canadian statistical and policy communities by reinforcing domestic networks.

The methodological work of the WPIIS underlies most Canadian statistics on the diffusion of the Internet across the Canadian society and economy. The WPIIS work on model surveys and the e-commerce definitions were especially important. The benchmarking of the Canadian information society against that of other countries was one of original goals of the project; OECD analytical compendia such as the *Information Technology Outlook* and the *Science and Technology Scoreboard* constitute an invaluable source of information for the user community, and both were enriched by the work of the WPIIS and related working parties.

The elaboration of a formal annual Memorandum of Understanding (MOU) between Statistics Canada and user representatives is undertaken to outline the management structure, responsibilities and deliverables of the project. This annual undertaking has brought focus and clarity to the project. The user's representative role is to identify relevant policy issues, provide subject-matter expertise where appropriate and act as liaison with outside stakeholders. The statistical agency is responsible for all statistical aspects of the work, including methodological and operational aspects, the creation and maintenance of data bases and the dissemination of statistical material. It is also responsible for the day-to-day management of human, financial and information resources required for the project. Individual teams are formed to deliver specific parts of the project, teams which often involve members from the user community. The MOU project co-ordinators – one from each party - act as the project's Steering Committee, who is responsible for the regular monitoring of progress towards the agreed objectives and the provision of advice to team members and users alike.

At the end of each year, the parties to the MOU are required to submit a report to a federal Policy Research Data Group (PRDG), the main sponsors of the statistical program, in which they provide answers to the following questions:

- What policy (ies) is the project intended to serve?
- What did the project produce during the year?
- Were the outputs commensurate with the intended deliverables and did they meet scheduled milestones?
- Were any adjustments made to deliverables and, if so, what were they and what were their impacts?
- Was the quality of the data high enough to allow for sound policy research/development?
- How has the data been used for policy research/development, and what further use is planned?
- How and by whom are the data used in the broader research community? What are future opportunities for wider use?
- How has the data contributed, or added value, to informed policy research/development? What forthcoming cross-cutting policies will the data help research/develop?
- Were full or partial funding sources found to support the program and, if not, what is the impact for policy research/development?
- What efforts have been made to secure alternative funding?
- Are users investing in the project in addition to PRDG funding?
- What are the prospects for alternative funding in the future?
- What suggestions should be considered for improving data output, delivery, communications etc.?

Together, the Memorandum of Understanding process and the report to the PRDG have provided a means to assess and to assure the relevance of the program on an on-going basis. These two processes have also fostered efficient communications among users, suppliers and funding partners.

Though the Information Society Statistics Program is designed with specific users and uses in mind, efforts are made to reach a wider audience. This fulfills Statistics Canada's mandate of informing Canadians on transformations to their economy and society. It also contributes to maximizing the return on the investment into the program. The next section briefly discusses how this has been achieved.

Reaching a wider audience of users

The interest in information society statistics extends well beyond the purview of sponsoring policy departments, though the use by others is more difficult to track, and the impact of use more difficult to assess.

Statistics Canada informs the general public of the main findings of its work - directly or indirectly by the media – primarily through its official release bulletin, *The Daily*. *The Daily* publishes news releases on current social and economic conditions and announces new products. The Information Society Statistics Program has published six news releases in 2008 and 2009, and each received strong media coverage.

Canadians also enjoy free access to summary statistics on Statistics Canada's web site; summary statistics tables dedicated to the use of ICTs by citizens, businesses and institutions have been viewed 77,000 times between April 2008 and the end of July 2009. To put this into perspective, the summary statistics table that provides key monthly and quarterly economic indicators - such as GDP, government expenditures, unemployment rate, trade and consumer prices - was viewed 133,000 times during the same period.

Users interested in more comprehensive data can download statistics from the Statistics Canada's detailed on-line data base (CANSIM). This service is free for users of the E-stat module, an online learning tool designed for use by the educational community. Between April 2008 and the end of July 2009, there were more than 230,000 downloads of time series related to ICT use. Three of four downloads were made by users of the E-Stat module.

Besides federal government departments, the public and the education community, the data are frequently used by provincial governments and their statistical organizations, industry associations, the media, consultants and the academic community. In addition to the public data sources outlined above, these organizations often request tabulations to meet specific needs. In the case of the CIUS data, users can specify their own tabulations by accessing the public use micro data file. Moreover, academic researchers and government policy analysts can access the complete micro data through Statistics Canada's Research Data Centres.

One of the most recent user outreach activities is the provision of learning resources to secondary level students and teachers in business or information society studies through the E-stat initiative. The resource consists of a learning plan developed with Information Society data. Students learn about the profile of Internet shoppers and Internet businesses by using resources available on the Statistics Canada website and are asked to develop a business plan for their own Internet business. By referring to their business idea, the article they have read, and data they have gathered, students can discuss some of the advantages and disadvantages to selling specific products and/or services over the Internet. Statistics Canada learning activities as not only a way to promote numeracy in Canadian youth, but also to instil in future generations of survey respondents an appreciation of the importance of statistical information.

Beyond reaching as wide an audience as possible, the program attempts to maximize the return on investment by sharing subject matter and technical expertise to the benefit of the statistical system. The next section briefly discusses how this has been achieved.

Maximizing the investment by sharing knowledge

Being among the first to engage in the development and implementation of an Information Society Statistical Program, team members have been able to play a significant role in advancing related statistical issues, including guidelines and international standards on the information society, and to promote related work through outreach, capacity building and training activities. Such involvement was an agreed deliverable in all Memoranda of Understanding. This was seen by the user community as a necessary activity to reap the benefits of international harmonization of statistics.

Canadians contributions include active participation in the OECD Working Party on Indicators for the Information Society (WPIIS), the work of which has been of fundamental importance to the progress of the project and to the international comparability of these data. Canada also contributed to the work of the UN's International Partnership on Measuring ICTs for Development, to the development of a manual for Information Society statistics and to the 2003 and 2005 UN World Summits on the

Information Society. The information produced as a result of these undertakings is widely used by the OECD, ITU, UNCTAD[10] and other organizations.

The group has also been involved in supporting country specific, or region specific, statistical development initiatives by providing subject-matter advice and technical assistance. For some projects, Statistics Canada partnered with the International Development Research Centre, a Canadian Crown corporation that works in collaboration with researchers from the developing world in their search for the means to build healthier, more equitable, and more prosperous societies. Bilateral initiatives include several workshops with colleagues from the Caribbean and Latin America, Africa and China.

A changing policy environment and new information needs

The main thrust of this paper has been to demonstrate the close ties between Information Society policy and statistical developments over the last 15 years. Those involved are convinced that at least two conditions are necessary for the statistical program to continue:

- Information Society issues need to remain high on the federal policy agenda;
- The close ties between the policy agenda and the statistical program need to be maintained, perhaps even reinforced.

The most recent policy initiatives - domestic and international - are already re-shaping the Information Society Statistical System.

The first such event was the May 2007 OECD Council at Ministerial Level. In the final declaration, Ministers welcomed plans for an OECD Innovation Strategy that could make an important contribution to policymaking in OECD and non-OECD economies. Statistics and measurement issues are central to the Innovation strategy and new initiatives to support the strategy are focusing on harmonized micro data analysis, a relatively unexplored domain.

There are at least three such initiatives, completed and/or on-going, directly or indirectly linked to the Innovation strategy:

- The OECD's National Experts on Science Technology Indicators (NESTI) and the Working Party on Industry Analysis (WPIA) engaged in a project to exploit firm-level data from innovation and performance surveys to conduct impact analysis. Canada participated with other OECD countries, using data from its 2005 Survey of Innovation and Survey of manufacturers.
- A similar large-scale project involving 13 European Union countries is on-going and has produced a number of studies to assess the impacts of ICTs on firm performance. Canada did not participate in this project because it did not have the necessary technical infrastructure in place, or the resources to quickly deploy such an infrastructure.
- The Working Party on Indicators for the Information Society is conducting a multi-country study to understand the role of ICTs as an enabler of innovation, a study based on linkage of data from innovation and ICT use surveys. Canada is one of the participants.

These analytical projects are ambitious and their successful implementation depends to a large extent on building new capacity in member states. Statistical agencies, and their policy partners, have a major role to play through the development of new indicators and continued participation in analytical projects involving micro data linkages. The agencies that already have institutionalized surveys of innovation, business practices and technology use (in particular ICT use), and whose results are linked to business performance data, are better positioned to contribute.

The OECD Seoul Ministerial Meeting on the Future of the Internet Economy also called for the development of statistical systems and analytical capacity. More specifically, the Declaration calls for "improving statistical systems to measure the changing access and use of the Internet and related ICT networks by citizens, businesses and institutions in order to provide reliable measures of evolving uses and the impact of the Internet on economic performance and social well-being". The report *Shaping Policies for the Internet Economy* further calls for indicators and analysis to:

- Improve our ability to identify the drivers of Internet access and applications and measure its use by citizens, businesses and institutions.

[10] International Telecommunication Union and United Nations Conference on Trade and Development.

- Enable the evaluation of the impact of the Internet on economic performance, notably on productivity and innovation, and social well-being, particularly through improved access to education, health and government services.
- Enhance our understanding of differences and barriers to its use, including issues of confidence.
- Enable a better understanding and quantifying of various aspects of the Internet, such as its size, areas and patterns of growth, or potential vulnerabilities, through the measurement of Internet traffic flows.

In some ways, the Seoul Declaration complements the Declaration of the 2007 Council at Ministerial Level, while in others it more specifically challenges statistical systems. Both Declarations insist on the need to evaluate the impact of specific business practices on economic and firm performance; in addition the Seoul Declaration calls for the development of new indicators.

On the domestic scene, Industry Canada was tasked with the development of a broad strategy on ICT adoption and the ICT sector as a follow-up to the Seoul Ministerial meeting. Progress has been made towards articulating such a strategy around six clusters: modernizing network infrastructure, protecting the online marketplace, accelerating ICT adoption and use, supporting digital media and digitization, promoting the domestic ICT industry and improving e-skills and digital literacy.

The Minister of Industry invited over one hundred and fifty leaders from business, academic and consumer organizations to a Forum on the Digital Economy in Ottawa on June 22, 2009. The goal of the Forum was to help develop a policy agenda for the Digital Economy that would include the following themes: promoting business innovation using information and communication technologies (ICTs), building a digital infrastructure for the future and ensuring a safer, stronger online marketplace. Finally, the economic downturn has prompted a sizeable public investment in the broadband infrastructure, an investment aimed at deploying broadband in unserved or underserved rural and remote areas of Canada.

Necessary improvements to the statistical system

Recent international and domestic policy initiatives all point to the key role of ICTs in the innovation process. These initiatives require research to gain a greater understanding of the impact of ICT use on innovation and more generally, on the impact of innovative practices on economic and firm performance.

For this kind of analysis to be possible, statistical agencies must at a minimum:
- conduct relevant and comparable surveys of innovation and ICT use;
- develop and maintain data bases that link the results of these surveys with firm performance indicators;
- develop and maintain analytical capacity.

The number of countries with the necessary infrastructure to fully engage in this type of analysis is relatively small, albeit larger now than a few years ago. The EU project to assess the impacts of ICTs on firm performance is based on this type of infrastructure.

The business data linkage project currently underway in Canada, should it continue, will be a valuable asset for this purpose if it integrates a timely and complete set of variables measuring innovation and technology use. The data linkage initiative is part of a broader exploratory project that includes the development of a longitudinal survey to track various business practices and strategies. Together, these tools are intended to support analytical work looking into the impact of various business strategies and practices on business performance. This exploratory project results from a partnership with users, and its continued existence is contingent on the renewal of that partnership.

These statistical initiatives, like others in the past, will provide much better returns on investment if they are based on a set of accepted standards. With that in mind, the statistical community could make a valuable contribution by recommending, and defining, a list of core variables for the purpose of firm level impact analysis.

Though necessary, the *ex post* linkage of data from different sources may not be sufficient to support firm level studies going forward. Experiences from different projects show that this approach is not

without limitations; one of the reasons is that the surveys and administrative data files from which the variables are drawn were not necessarily designed with that specific analytical purpose in mind.

The statistical community would make a valuable contribution by identifying cases where integration of the content or methodologies of distinct surveys would significantly enhance firm level impact analysis. This work could eventually lead to innovative thinking about model surveys and pilot projects. Again, the Canadian experience gained with its General Business Panel Survey (GBPS) pilot project might provide useful insight.

The future relevance of firm level micro data analysis also depends on the development of new indicators. For instance, in the case of ICT use, indicators of the deployment of various e-business processes and of the level of integration between these processes within firms and along the supply-chain are important to understand the productivity effect of ICTs. Up until 2007, the Canadian survey collected information on the uptake of on-line sales and on-line purchases only (e-commerce). In 2007, measures of the deployment of e-business processes to manage selected logistics and customer relation activities were added. This is seen as a necessary first step towards the improvement of the survey.

The data integration issue is not as prevalent in the household and individual statistics domain. In Canada, and elsewhere, surveys of ICT use by individuals often collect, or are linked to, the socio-economic variables necessary to conduct useful analysis. That said, a redesign of the Canadian survey could significantly enhance its relevance.

In particular, the analytical value of the program would benefit from a shift in measuring use from home for personal non-business reasons to measuring use from any location and for any purpose. The home-centric approach of the Canadian survey is a legacy of the early policy objectives of connecting all homes to the Internet. The issues of the day – for instance protecting the on-line market place, supporting digital media and digitization and improving e-skills and digital literacy – are much better informed by broader measures of use. As well, given the increasing dependency of citizens on the Internet in various facets of their lives, it is difficult to assess the full impact of the technology without a more holistic measure of its use. Such a shift in paradigm would also allow to use the survey of individual to understand the impact of the Internet in the workplace, or perhaps more interestingly, on the organization of work and business processes.

Conclusion

In October 1998, there were very few official statistics to inform the OECD Ministerial Conference on Electronic Commerce held in Ottawa. Ten years later in Seoul, at the OECD Ministerial on the Future of the Internet economy, statisticians were able to offer a compendium describing the information society in statistical terms and, in doing so, showcased the progress made towards evidence-based policy making and analysis in this relatively new domain of interest. That progress would not have been possible without bringing users and producers of statistics at the same table. Early on, those around the table were from OECD countries; they have since been joined by colleagues from around the world.

Many believe the transformative powers of information and communication technologies will only intensify, creating opportunities and threats for economies and societies, and influencing the future competitiveness and success of nations. Policy analysts and statisticians can expect the demand for information to describe these transformations and understand their impacts to build up.

The statistical system is now sufficiently robust to start informing on the outcomes and impacts of ICTs in our economies and societies. However, as this paper illustrates with the Canadian experience, it is still very much a work in progress. The model used to develop indicators and measure outcomes and impacts has, thus far, worked well and should be seen as an asset for future development. But the task has become more complex with time. At first, the statistical system was expected to develop indicators that describe the information society and to develop a framework to present statistics in a useful way. It is now being asked to develop frameworks to produce internationally comparable analytical outputs. The need to pool resources and share knowledge and best practices seems more important than ever before.

Metadata
Descriptions of the components of Canadian information society statistical programs as well as links to data releases, selected data tables and analytical studies are available on Statistics Canada's web site (www.statcan.gc.ca) To access the information, select "Find statistics by subject" on the home page, then select "Information and Communications Technology".

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