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**MEASURING THE NETWORKED ECONOMY**

Paper prepared by Statistics Canada

**I. INTRODUCTION**

1. What makes the economy different in the 21st century from the past is the recognition of the importance of the ties that bind together economic and social actors. These ties, between suppliers and firms, between firms and clients, between governments and constituents, are made easier by an infrastructure of information and communication technologies (ICTs), the very same ICTs which have been credited by A. Greenspan with sustaining the long period of growth of the US economy. Recognition of the importance of the links shifts the measurement and analytical interest from what the actors are doing, the businesses, the public institutions and the consumers, to how they are linked together into a networked economy.
2. The government is promoting the networked economy through its own commitment to become a model user of the Internet so that, by 2004, Canada will be known around the world for having the government most electronically connected to its citizens. It is also committed to bringing high-speed broadband Internet access to residents and businesses in all communities in Canada, again by 2004. High speed Internet access will facilitate distance learning, medical services, links between businesses and their suppliers and customers, and new forms of electronic business.

However, there is more to this than just business and public service delivery, there is also the impact on the democratic process.

3. While ICT infrastructure is important, its impact depends on what is displayed, processed, stored, and transferred by the network. Electronic content is what matters to the people downloading music, games, videos, and software. Being able to receive electronic specifications for the manufacture of parts is part of doing business in some industries, as are electronic sales and payments. The commercial importance of content is seen in the mergers between firms like Time Warner and those that provide access to the network like America Online. In Canada, the creation of Globemedia brings together a broadcaster, a daily publisher, an Internet content provider. An Internet portal allows Globemedia to deliver content to a wide customer base through print, broadcast, and the Internet.

4. With the encouragement of governments, the engagement of business, and the participation of consumers, the networked economy is here to stay and to grow. Much of it functions just like the economy that the existing statistical system is designed to deal with: goods and services are produced, exported and imported; investment is made in fixed capital; and, the labour force is engaged in all of these activities. There are statistical measures of production, trade, value added, labour, capital, and productivity. What then is different about the networked economy and why should that difference interest the statistical office?

5. Measurement problems arise when classification systems do not allow the observation of new economic realities. For example, cable companies primarily provide programming services and for that they are classified in class 51322 (Cable and Other Program Distribution ) of the North American Industry Classification System (NAICS). However, these companies also provide access to the Internet and some are able to provide telephony. This means that the activities and services provided by cable firms overlap with those of telecommunications firms (NAICS 5133), and independent Internet service providers (NAICS 512191). The reverse is also true. As a result of this convergence, there has to be a commodity dimension in cable and telecommunications surveys if the full picture on Internet services provision is to be presented.

6. A well articulated classification of commodities, in particular of service commodities, is essential if the Input-Output tables are to reflect changes in the organization of economic activity and the emergence of new activities. The elaboration of such a classification is the goal of the North American Product Classification System (NAPCS) project. The NAFTA countries have just completed the first phase of this project. A draft classification of commodities produced in selected countries is about to be tested by national agencies. This draft includes commodities of particular interest for the networked economy, such as telecommunications services, on-line services, infrastructure provisioning services and software products.

7. While new products and industries are appearing, the ways of doing business are changing. Firms are now able to deal with one another electronically, to gather information, to put questions, to order products and to pay for those products, all on-line. This means that both suppliers and customers can be anywhere, and that has implications for balance of payment statistics if digital products are crossing Canadian borders without being recorded. An indicator of the volume of this activity is the value of electronic sales and purchases by firms and by people.

8. The network has implications for the price of products as they can be sold on the net in a conventional manner, or auctioned. The products themselves can be specified by the client and priced interactively, and the quality of products can change in real time response to market signals. While rapidity of response to customer demand and a wide variety of products on offer are benefits of the networked economy, these benefits only accrue to those firms and people who are able to take advantage of the network.

9. If it is important in the present and essential in the future, to be part of the networked economy, there are firms, and people, who will be disadvantaged both economically and socially if they cannot participate. This may result from a lack of skills, basic literacy, or physical access, or other factors which contribute to what is known as the 'digital divide'. Surveys are able to provide indicators of the state of levels of access and of barriers to access for firms and for people.

10. Classification, trade and network access are important for the Canadian statistical system and for Canadian policy making. However, these topics cannot be considered in isolation, not in a networked or global economy. This paper starts with a look at what is going on in the Organization of Economic Co-operation and Development (OECD), the European Union, and in Canada's principal trading partner, the United States.

## **II. AN INTERNATIONAL PERSPECTIVE ON THE NETWORKED ECONOMY**

11. Statistics Canada works closely with the OECD, the European Union, the US Department of Commerce, and other national organizations, as part of its work on the networked economy. These working relations ensure that local initiatives are part of what is going on internationally and they also afford an opportunity for leadership.

12. The OECD has the role of providing concepts and definitions to support data collection and comparison for the networked economy. It has published an industry-based definition of the information and communication technology sector and produced a first publication in which the ICT sector data are compared (OECD 2000). In 2000, after discussions in Canada, Europe and the US, it released broad and narrow definitions of electronic commerce which are now being used in surveys. Work continues on defining ICT commodities, influenced by the NAPCS project, and on defining the content sector so that statistics can be gathered on the production and use of the content which is delivered by the ICT infrastructure. This content includes the practices and tools of knowledge management, an activity which is attracting growing attention (OECD 2000a)

13. At Eurostat, the statistical office of the European Union, a cross-economy survey of the use of electronic commerce by business was launched in November 2000 and results are expected during 2001 and 2002. The definition used was that of the OECD and Statistics Canada participated in discussions leading up to the survey.

14. The United States has focused on electronic commerce in retail trade and on access to the Internet. The US Bureau of the Census (2000) first released figures for retail electronic sales for the fourth quarter of 1999 in March, 2000. These figures showed that electronic sales amounted to 0.6% of total sales, a relatively small number. Of course it does not include all of business to consumer electronic commerce as it excludes, for example, financial services and transportation.

As subsequent quarters were released, the percentage of sales increased to 0.8% for the third quarter of 2000.

15. Questions on electronic commerce have been placed on annual business surveys conducted by the Bureau of the Census for the year 1999, the first to use the NAICS classification, and results for 1999, and for 1998 are expected in March 2001.

16. While electronic commerce is seen as an indicator of participation in the networked economy, there is also interest in measuring access to that participation. A series of reports (US Department of Commerce 1999, 2000) give substance to the interest in the digital divide in the US and this has stimulated work at the OECD (OECD 2001).

### **III. SURVEY ACTIVITY AT STATISTICS CANADA**

17. Statistics Canada is actively engaged in measuring the networked economy and in working closely with the policy community which uses the results. This is due largely to the support of the Policy Research Initiative (PRI), which, on April 1, 2001, will enter the third year of a four year programme. The new activities divide into three broad categories: infrastructure; applications; and, analysis.

#### **Infrastructure Surveys**

18. The infrastructure surveys, supported under the PRI 'connectedness' project, are telecommunications; cable; Internet service providers; and, computer services. Each of these industries belongs in the OECD definition of the ICT sector.

#### **Telecommunications**

19. The telecommunications survey is older than Statistics Canada and it continues to chronicle the connection of Canadians and their businesses as the industry deregulates, new firms enter, and technology changes. There is an annual survey and, in 1999, the monthly survey which covered only wireline telephone operators was replaced with a new quarterly telecommunications survey.

20. The new quarterly added facilities-based wireline entrants and wireless telephone operators, and estimates for the contributions of resellers, satellite and other telecommunications providers, to arrive at a quarterly measure of activity for the telecommunications industry group (NAICS 5133).

21. Most high speed access to the public switched telephone network (PSTN) is provided by Internet service providers (ISPs) but the quarterly survey reports on the provision of high-speed backbone services to the ISPs and large data users. To capture the changing technologies, the data identify mobile connections as digital or analogue. Digital connections are needed to support the growing multi-media services and in 2001, data on the number of web-ready mobile handsets will be collected. This will complement other measures of Internet access.

22. As of the third quarter of 2000, there were 29 million access paths to the Canadian PSTN, or close to one access path for every Canadian. This access was mainly through wireline, with 21

million access paths, rather than mobile, which accounted for 8 million access paths. However, the growth is through mobile access, up 26% from the third quarter in 1999, and most of this growth was in digital service, which increased 73% in the same period.

23. The mobile telecommunications service providers spent \$1.3 billion in February 2001 at an auction for new spectrum. The new spectrum will allow the service providers to include broadband to support web-browsing, multi-media, and electronic commerce for their subscribers. Capital expenditure for the first three quarters of 2000 amounted to \$4 billion for both wireline and mobile telecommunications service providers, with three-quarters going to wireline infrastructure. Most of this investment is necessary for broadband service.

### **Cable and Other Program Distribution**

24. The cable industry is becoming a major player in the Internet access market, in addition to its delivery of television and audio programming. To report on this, the provision of high-speed Internet services was added to the survey for reference year 1999. The survey found (April 2000) that, less than three years after cable -modem services were launched, 61 companies provided such services to more than 364,000 subscribers. These represented about 11% of all household Internet subscribers. Cable-modem services were most popular in Western Canada, where close to 43% of subscribers resided, compared to 34% of all home Internet subscribers.

25. For the 2000 reference year, the survey is collecting information on the deployment of high-speed Internet access and digital television, in addition to information on subscriptions to, and revenues from, Internet access services. Information on the deployment of high-speed Internet access measures progress towards universal access to broadband Internet by 2004, a goal of the government. The survey supports analysis of differences in urban and non-urban areas and its information on digital television may provide an indicator of the future of WEB television. The new data are anticipated in the autumn of 2001.

### **Internet Service Providers, Portals and Related Services**

26. This is a new survey, developed as part of the Policy Research Initiative, that will produce its first results for the year 1999 in the first half of 2001. It will provide standard input to the SNA and it makes use of the commodity classification work of the NAPCS project. It will produce information on electronic commerce products provided, the distribution of business and personal subscribers by province and the capacity of access, whether it is narrowband (64 Kilo bits per second (Kbps), or less) or broadband (more than 64 Kbps).

### **Computer Services**

27. The computer services survey has been completely redesigned and, in addition to the standard inputs to the SNA, it will produce information on electronic sales and purchases by firms in the industry. The information on electronic commerce will provide a test of such questions on annual industry surveys and how the aggregate figures compare with those from the cross-economy survey. The survey is also making use of the commodity classification work in the NAPCS project.

### **Surveys of Applications of the ICT Infrastructure**

28. Surveys about the provision of the ICT infrastructure have to be complemented by those for respondents that use the infrastructure. The most pervasive use is Internet access by public and private institutions and by people

### **Information, Communication Technology and Electronic Commerce Survey (ICTEC - 1999)**

29. Statistics Canada, working closely with Industry Canada, the US Bureau of the Census, and with the OECD, designed the first ever cross-economy survey of electronic commerce activity and it also measured the use of ICTs as an indicator of readiness for electronic commerce. The survey used the infrastructure of the Capital Expenditure Survey and it collected data for 1999. The results were released in The Daily on August 10, 2000, well within a year of the reference year, and they demonstrated that the activity of electronic commerce in Canada was small. It was less than 0.2% of total operating revenue of the business sector (Bakker 2000).

30. The survey has been redesigned and simplified for the year 2000 and renamed the Survey of Electronic Commerce and Technology (ECT - 2000). Results will be released in April 2001. A larger signal for electronic commerce is anticipated and, as a result, the data quality and detail will be better.

31. While the ECT survey reports in a timely manner, there is interest in more frequent readings, perhaps quarterly, at a lower level of detail, with a more detailed measure annually. There is more than one way of doing this and consideration must be given to having the same unit of observation and analysis so that data from the various surveys can be compared.

### **Household Internet Use Survey (HIUS)**

32. The HIUS has been in place for some years and it provides data on the use of the Internet by households in Canada (Dickinson and Ellison 2000) and, consequently, on the digital divide. It does this by adding questions to five out of six panels of the Labour Force Survey (LFS). For 1999 it collected data for the first time on electronic purchases made from home by households that have a regular user of the Internet. The survey found \$417 million in Internet purchases, of which \$250 million were made in Canada (Ellison et al. 2001).

33. This survey was conducted again for 2000 and the results will be released in the summer of 2001. As in the case of the ECT survey, the volume of Internet purchases is expected to increase with respect to the 1999 results, and this may support more detailed breakdown of the data.

34. The 1999 results were for electronic purchases made from home by households that have a regular user of the Internet. This measure was made because of the policy interest in the connection of households. However, there is also interest in the total value of purchases made on the Internet and in measures of the Internet activity of individuals, as well as households. At an OECD discussion in November 2000, it was suggested that households with Internet access and the barriers experienced by households in gaining access were suitable indicators for households,

but that purchases and other activities on the Internet were better measured for individuals. This debate will continue.

### **The General Social Survey (GSS) - Cycle 14**

35. The GSS Cycle 14 has collected data on individuals and their access to and use of the Internet. This provides information on the digital divide which complements that from the Household Internet Use Survey. The first release of data and analysis is expected by the end of March 2001.

36. The GSS includes a comprehensive analytical programme and papers will follow on how the Internet affects the lives of people and how these effects are influenced by gender and age. The use of computers at home, telework and skill requirements are also to be examined.

### **The Workplace and Employee Survey**

37. New data from the Workplace and Employee Survey (WES) 1999 were released in The Daily on February 19, 2001. The survey provides an integrated view of the activities of employers and employees and from the perspective of the networked economy, it supports analysis of the use of computing technology and its use in learning.

38. The survey found that nearly one-quarter of all workplaces, accounting for more than a third of paid employees, made a significant investment in new computer technologies in 1999. These investments were not associated with either higher employee layoff rates or slower employment growth. They were associated with growth in computer-related training. Future work will examine the relationship between the level of education of the workforce and the capacity of the firm to adopt new technologies and to innovate.

### **Other Surveys**

#### **Knowledge Management**

39. The use of ICTs has made easier the monitoring and management not just of information flows but also of knowledge flows in public and private institutions. Statistics Canada, in collaboration with other federal departments and agencies organized an OECD High-Level Forum on Knowledge Management in Ottawa in September 2000. An outcome of this meeting was a proposal to develop a pilot survey of the use of knowledge management practices, tools and infrastructure in business. The first planning session took place in Denmark in February 2001 followed by a second meeting in Ottawa later that month. A draft questionnaire is now under consideration by OECD member countries and there are immediate plans to undertake a pilot survey in Canada, Denmark and the US.

#### **Analytical Activity**

40. Much of the analytical activity has been covered in the discussion of the surveys. However, the Connectedness Series has been launched specifically to publish articles on how Canadians are connected in a way that ensures the consistent application of concepts and definitions across

sources. In addition, the first Canadian compendium of data on the ICT sector has been published (Statistics Canada 2001).

41. The principal analytical integrator of a statistical office is the System of National Accounts and consideration is now given to the networked economy and its impact on the SNA.

#### **IV. IMPLICATIONS OF THE NETWORKED ECONOMY FOR THE SNA**

42. With some exceptions, the SNA captures well data on industry output, incomes, expenditures and capital investment associated with the networked economy. However, the current availability of surveys and administrative data sources, and SNA industry and commodity classifications, make it difficult to estimate the explicit impact and contribution of the networked economy to overall GDP. Rapid changes in technology and the services, provided through the networked economy, make the measurement of price change, real output, and productivity an added challenge.

43. The Input-Output tables provide the most comprehensive structure to measure and analyze the networked economy in the SNA. These accounts, which are available approximately 30 months after the reference year, provide the benchmark from which timely SNA measures; Monthly GDP by Industry and the Quarterly Income and Expenditure Accounts are projected. To date, however, surveys and other data sources that feed into the Input Output accounts are very limited in this area. Recent developments in surveys and classification modifications will make it easier to measure the networked economy within the SNA.

##### **Supply of Internet Services - Industry Output**

44. In the NAICS based Input-Output tables (beginning reference year 1997), Internet services are produced by several industries that fall in the areas of:

- Information services
- Telecommunications
- Cable and Other Program Distribution
- Computer Services

45. The production of Internet and related services by these industries are captured in IO Commodity “On-line services”, which provides an estimate of the aggregate value of output.

46. Prior to 1997, the SIC80 based industry-commodity detail provides no explicit means of estimating the value of output of on-line services. This is implicit in the output of telecommunications carriers, cable, and computer service providers.

##### **Measuring Real Output**

47. The first measure of change in real output for “on-line services” will come with the deflation of the 1998 Input-Output tables later this year. The availability of price statistics for Internet access services, is to date, limited to a Hedonic price index for the CPI. The application of this



price index for the deflation of business Internet use and production of Internet service provider (ISP) services has yet to be tested.

48. The quality of real output for ISP industries is also dependent on the availability of information on revenue by type of service produced by communications and computer service companies and enterprises (Bell Canada, Rogers Cable etc.). These data are expected to improve with new survey results that will be incorporated into the 1999 Input-Output tables.

#### **Demand for Internet Services - Intermediate and Final Demand**

49. Business purchases of On-line services (intermediate demand) are included in the operating expenses of business establishments and enterprises. The existing surveys and administrative data sources, however, do not uniquely identify on-line services as a separate expenditure item, but include them within communications services. Household expenditures on Internet services are obtained from the Survey of Household Spending.

#### **Purchases of Goods and Services, Intermediate and Final – Via Electronic Commerce and Shopping**

50. The Internet provides an alternative way for producers and distributors to sell merchandise and services; and for business, government and household to make purchases. Inclusion of the value of these transactions, is essential in the measurement of GDP, both the Value-added by industry and the Expenditure approach. On-line purchases by business and government are included in operating expense statements, but not necessarily identified as such.

51. For private consumption, on-line shopping is largely an extended service of retail establishments (Sears, Chapters etc.) and, as such, the value of these sales is captured in the Retail Trade Survey. For example, Ford, the first automotive producer to offer on-line purchasing of vehicles, delivers its product to customers through local dealerships, where the value of sales is recorded. In addition there is an annual survey of Direct Sellers to cover NAICS Industry "Electronic Shopping and Mail Order Access". On-line purchases from abroad are expected to be recorded in the operating expenses of businesses and the Survey of Household Spending for consumers.

#### **International Trade**

52. International trade estimates in SNA need to capture cross border sales of on-line services and the value of sales and purchases through e-commerce and shopping.

53. Balance of Payments surveys capture the value of trade in Information Services, which include a wide range of on-line services and other information services. There is at this time, however, no explicit identification of ISP. As for Internet related sales and purchases of goods, trade statistics capture cross border flows of merchandise resulting from e-commerce and e-shopping. Furthermore, Balance of Payments surveys ask to include sales and purchases made on-line. There are some concerns, however, that business and household imports of services (including digital download products) are being captured in business and household spending surveys, but not in the international trade statistics.

## **Labour and Capital**

54. Factors of production of the services for the Networked economy; labour (employment and payment of wages and salaries) and capital investment in plant equipment and software, as well as, depreciation of capital stock are included in the SNA, but captured on an industry basis. This again, poses the problem of the industry versus the activity. What share of the cable industry's workforce and capital stock is attributed to the ISP? Is the revenue share a suitable proxy? The distinction is essential in measuring productivity for the networked economy.

## **V. GAP AREAS**

### **Timeliness**

55. Surveys provide information to the SNA and to policy makers and the broader community of users. The needs for information on the networked economy change as policies change, and as Canadians seek information, which helps them to participate in public policy debate. The redesign and introduction of new surveys take time to feed into the SNA. The Input-Output tables will incorporate 1999 survey results in 2002. This lack of timeliness limits their usefulness, given the rapid changes in this sector of the economy.

### **Time Series Consistency and Technological Change**

56. An example of a potential gap in the statistical system is information on broadband as it facilitates high quality multimedia communications. As the policy interest grows, there will be demand for statistics on the production and use of broadband Internet services. This is also relevant to the debate on the digital divide. Within the SNA, this poses a problem of time series consistency, as traditional industry detail changes structure. The rapid growth of the networked economy will not only have profound changes on the importance and structure of the communications industry, but will be far reaching into other service sectors such as, finance, tourism, entertainment, education etc.

### **Data Linkage**

57. The observation by A. Greenspan that ICTs in the US have been responsible for growth has stimulated interest in the link between the use of ICTs by Canadian firms and their performance. This could be addressed by linking the data from the Electronic Commerce and Technology Survey - 2000 to administrative data and data from other surveys.

### **Digital Divide**

58. Access to the Internet by Canadians is a public policy issue of growing importance. The GSS Cycle 14 data provide a wealth of information on the subject but that information is likely to stimulate more questions about the digital divide, questions which can only be addressed by a statistical office.

## VI. CONCLUSION

59. The networked economy is changing the way business is conducted and lives are led. New surveys and industry and commodity classifications are required if the System of National Accounts is to continue to reflect economic reality. This paper has described the changes in the systems of classification, the revision of existing surveys and the introduction of new surveys to ensure that relevant information continues to flow to the SNA.

60. While the SNA supports economic policy development, there is also a need to contribute to industrial and social policy and new surveys, or new commodity dimensions to existing surveys have been developed to provide this information. Much of this work has been supported by the federal Policy Research Initiative and has included extensive collaboration with the relevant policy departments and with international organizations. The networked society cannot be analysed in isolation.

61. Policy needs are evolving, and the SNA is dealing with new classification systems and other challenges of integration. As a result, gaps continue to be identified in the statistical system and, through consultation and discussion, plans are being put in place to address them. This paper is part of that process.

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