WORKING DOCUMENT

Measuring the

Global Information Infrastructure

for a

Global Information Society

Concepts and Performance Indicators

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Measuring the Global Information Infrastructure for a Global Information Society

Concepts and Performance Indicators

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Note to readers . . .

As a member of both the G7 and the Organization for Economic Co-operation and Development (OECD), Canada is frequently called upon to share information about its economy in ways that could be of value to its international partners. Canada is also responding to the emergence of new issues by proposing a variety of means to facilitate the comparison and sharing of information.

In keeping with these roles, Canada, along with Finland, at the May 1995 OECD Ministerial Conference, which followed the Brussels G7 Ministerial Conference on the Information Society held in February 1995, expressed the need for an OECD report on the global information infrastructure-global information society (GII-GIS). It was recognized that policy makers need to be able to better quantify the growth of the GII and assess its economic, social and cultural impacts, and those of related policies, on those populations undergoing transformation in a GIS.

Canada undertook to prepare a paper on the topic, with specific reference to the Canadian experience in addressing the conceptual and practical matters in regard to measuring the information age. While the issues are complex and the future unknown, the need for rapid progress in this area is great. We offer the following insights, based on Canadian efforts to quantify the impacts of the GII-GIS within Canada's own borders, in the hope that they might be of some value to nations facing similar transformation. We would be grateful for further suggestions in these matters from interested parties. This paper forms part of the Government's overall work on Information Highway issues, as outlined in ***Building the Information Society: Moving Canada into the 21st Century.*** *In addition, Canada will continue to refine and improve on the data presented in this report, based on additional research within Canada, and comments received from other countries.*

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Highlights

We are in the midst of an information revolution. Understanding the transition to a global information society (GIS) requires knowledge and monitoring of the information economy, particularly the characteristics of the supply and use both of information and communication technologies (ICT) and of content delivered via ICT and other industries. The definition of the ICT Sector is still evolving. This paper provides Canada's views on the definition of the ICT and content industries, as well as the initial 1990 to 1995 data for these industries, as of September 1996.

- One of the difficulties in quantifying the GIS is the lack of agreement on its definition. International efforts to harmonize the existing definitions are currently under way. For the purposes of this paper, the ICT sectors are defined as:

  - the ICT services sector (broadcasting, telecommunication carriers, computer services);

  - the ICT goods sector (communication and electronic equipment, computing and peripheral equipment, office, store and business machines).

- Content is rapidly evolving and expanding in the GIS, making the application of a static definition for measurement purposes extremely difficult. However, the creation of content in services and goods delivered to consumers, businesses and governments is important to the future growth and development of the GIS.

- By 1995, the ICT services and goods sectors were contributing 6.8% to Canada's GDP (or $36.9 billion in 1986 dollars), up from 4.9% in 1990. In the same year, the ICT services and goods sectors employed 413,196 people, including the self-employed (3.1% of total employment, up from 2.8% in 1990).

- The ICT sectors consistently outperformed the economy as a whole. Between 1990 and 1995, the output of the ICT sectors increased by 50.0%, whereas the economy grew by only 7.7%. GDP growth was more pronounced in the ICT goods sector than in the ICT services sector.

- Employment in the ICT sectors grew by 11.2% during the 1990-95 period, substantially more than the 2.6% in the economy as a whole. This increase was attributable to the ICT services sector, as employment in the ICT goods sector actually declined.

- ICT sectors' revenues grew by 61.0% over the 1990-95 period, significantly exceeding revenue growth in the economy overall (16.5%). In contrast, ICT sectors' profits grew by 21.2%, about one-third as much as ICT sectors' revenues, whereas economy-wide profits grew by 43.1%, more than 2.5 times the growth of economy-wide revenues.

- In 1995, research and development (R&D) by the ICT sectors accounted for 36.1% of total private-sector R&D expenditures in the economy, considerably more than the ICT sectors' relative contribution to GDP and employment.

- International trade in the ICT sectors grew rapidly, reflecting the pace of globalization in the industries involved. It was dominated by the ICT goods sector and was generally characterized by deficits.

- Canada, together with other countries and international organizations such as the Organization for Economic Co-operation and Development (OECD), is in the process of developing new frameworks for measuring the global information infrastructure-global information society (GII-GIS). The North American Industry Classification System (NAICS), scheduled to come into effect in 1997, is a step in that direction, since it helps to define the information and cultural industries sector.

Section 1

Canada and the Information Economy

Section 1
Canada and the Information Economy

1.0 Introduction

Defining and measuring the economic, social and cultural impacts of the global information infrastructure (GII), related policies and the emerging global information society (GIS) offer new challenges. The difficulty lies in defining the sectors of the information economy, which encompasses a number of industries, including, but not limited to, information and communication technologies (ICT)[1] and arts and culture industries.

The term "information economy" encapsulates two important realities. First, there are a number of core industries primarily engaged in creating, producing, processing and distributing information. Second, almost every industry is using available information to enable it to reorganize and become more productive. An understanding of the difference between the two allows a more focused approach to the collection of data. Therefore, in measuring the information economy, it is important to study both the GII and the content within it. Although content is not well defined, it will drive the growth of the GIS.

According to existing data, the total contributions to the economy of the ICT and the arts and culture sectors are relatively large and growing rapidly. However, research indicates that additional work is needed to better define the industries and assess their contribution to the information economy.

Countries around the world are currently engaged in efforts to harmonize the terminology used to define and measure the ICT industries[2] and to identify, define and measure the creation of content in all industries. This is no small task. Content creation, production and distribution is increasingly prevalent in all industries and evident in all facets of the economy. The task is important, however, as the increased proportion of content and knowledge in end services and goods is rapidly changing the nature of the global economy and impacting society as a whole. While national and international co-operation will eventually result in the collection of more comparable data on which to formulate policies related to the knowledge-based industries, a priority, given the level of public concern, is to measure the impacts of ICT on employment.

Work has begun on measuring the demand and diffusion of ICT services and goods throughout the economy.[3] Such analysis is of immediate interest to policy makers who want to understand the use of ICT services and goods by residential and business users. It will also clarify which information services and goods are used by which segments of society and, equally important, which are not. In the end, a better understanding of the catalysts of and barriers to information flows will support the development of sound public policies and principles, the equitable development of the GIS and the efficient growth of the GII.

1.1 Supply

The information economy refers to the economic contribution of a limited number of industries and should not be confused with the broader definition "knowledge-based economy," which increasingly includes the entire industrial fabric of the economy.[4] This section provides a profile of the ICT sectors[5] and the arts and culture sector for the period 1990-95 on the basis of existing definitions, classifications and data;[6] definitions, coverage and data are given in the Statistical Appendices. As well, it highlights the need to measure both the use of ICT services and goods by residential and business end users and content produced by other industries.

[1] Organization for Economic Co-operation and Development (OECD), *Technology, Productivity and Job Creation,* March 1996. According to this report, the new ICT cluster represents the most spectacular current manifestation fo the development of new capacities to create value added, to improve efficiency or to develop new or improved services or goods.

[2] Canada, the United States and Mexico have made progress in reaching a consensus on how to define the information industry by developing the North American Industry Classification System (NAICS).

[3] Baldwin, Diverty and Johnson 1995; Mozes and Sciadas 1995; Sciadas 1996.

[4] Lee and Has 1995. This paper classifies 55 Canadian industries into high, medium-and low-knowledge sectors.

[5] Dora Mozes and Luis Leigh, Co-Chairs of the Canadian G-7 Working Group on Economic Measuring Tools and authors of *The Information Economy in Canada: Fact Sheets* (1995), provided an initial classification for these sectors.

[6] The analysis based on the period 1990-95 provides a snapshot of changes in these industries. In the future, an analysis of the industries based on a longer study period will be undertaken.

1.1.1 The Role of the ICT Sectors in the Canadian Economy

For the purposes of this paper, the ICT sectors include:[7]

- the ICT services sector (broadcasting, telecommunication carriers, computer services);
- the ICT goods sector (communication and electronic equipment, computing and peripheral equipment, office, store and business machines).

Each sector and its constituent industries can be assessed with the help of a number of economic and performance indicators to reflect the magnitude of their activity. The following indicators have been used: economic (GDP), employment, financial (operating revenues, operating profits, assets), research and development (R&D) expenditures and trade.[8] Time series data reflect growth and changes that characterized the ICT industries from 1990 to 1995.[9]

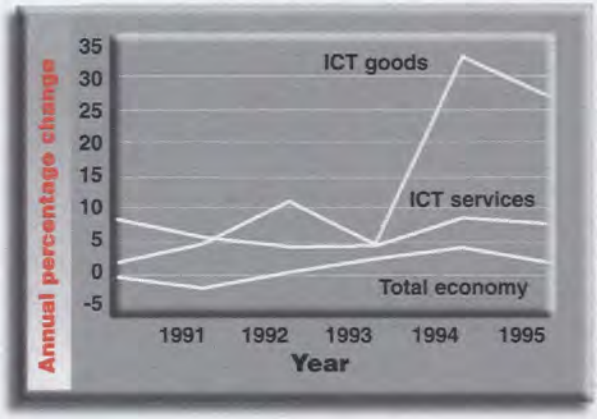


Figure 1
The ICT sectors' annual GDP growth

The ICT sectors' GDP

In 1995, the ICT sectors contributed 6.8% to Canada's GDP (or $36.9 billion in 1986 dollars), up from 4.9% in 1990. Between 1990 and 1995, the output of the ICT sectors increased by 50.0%, more than six times the increase of the overall economy. GDP growth in the ICT services and goods[10] sectors significantly outpaced that in other sectors of the Canadian economy.

Even during the prolonged recession of the early 1990s, the ICT services and goods sectors typically experienced growth equal to or better than the economy's peak growth rate over the 1990-95 period (Figure 1, Appendix 2, Table 1).

Figure 2
The ICT sectors' annual employment growth

The ICT sectors' employment

There were 413,196 people employed in the ICT industries in 1995. This was an 11.2% gain over the 1990 employment level (371,604 persons), and four times the rate of job creation in the total economy (2.6%) (Appendix 2, Table 2).

Job growth was uneven across the ICT sectors. Employment in the ICT services sector increased by 18.7% over the study period, an average annual (compounded) growth rate of 3.5%. In contrast, employment levels fell 8.2% in the ICT goods sector. Figure 2 shows that the ICT goods sector was subject to three periods of contraction. This was due in part to major restructuring in this sector and to the recession, which strongly impacted all the goods industries.

A noteworthy gain in employment of 11.1% was registered by the ICT goods sector in 1995. Given the goods sector's volatility, the change may not be indicative of a future trend. On the other hand, it would be premature to conclude that employment in this sector is in decline.

[7] A listing of the ICT sectors, with the specific industries associated with each sector based on the 1980 Standard Industrial Classification (SIC), can be found in Appendix 1. The SIC is to be replaced by the NAICS in 1997. See http://www.statcan.ca/Documents/English/Subjects/Standards/standard.htm for more information.

[8] Because of the breadth of the ICT industries and the fact that they are emergent, only partial data are available within sectors. To facilitate intersectoral comparisons, some modifications to the sector groups were required. See the Appendices for details.

[9] The paper's starting period, the end of 1989, is coincident with the historical GDP peak. Changes over the period 1990-95 are therefore not measured from the recession's trough. This has the effect of ensuring that the analysis does not inflate data on the growth of the ICT sectors.

[10] GDP for these sectors does not include value added for the specific and professional equipment industries (SIC 391); see Appendix 2 for details regarding industry exclusions for other variables.

The ICT sectors' operating revenues and profits

The ICT sectors' operating revenues were more than $57.1 billion in 1995.[11] Operating revenues for the ICT services and goods sectors grew by 61.0% over the period 1990-95 compared with economy-wide growth in revenues of 16.5%.

Growth in profits was not as strong as growth in revenues. The combined profits of the ICT services and goods sectors increased by 21.2% to $5.7 billion in 1995 (Appendix 2, Table 4), about one-third as much as sales increased over the same five-year period.

As a percentage of sales, operating profits were relatively stable for the ICT goods sector over the study period. They were in line with average rates of return (profits to revenues ratios) earned by all industries in the economy (Figure 3, Appendix 2, Tables 3, 4).

Profits to sales ratios for the ICT services sector were markedly higher than those observed for the ICT goods sector or the economy as a whole. However, they were in decline over the 1990-95 period.[12] High profits to sales ratios for the ICT services sector took on added significance because that sector accounted for 82.7% of the total ICT sectors' profits in 1995.

The ICT sectors' assets

Assets for the ICT services and goods sectors in 1995 were $82.7 billion, or 3.4% of the total assets in the economy. Growth in total assets for the ICT sectors was 37.8%, compared with a 25.1% increase in total assets for the economy (Appendix 2, Table 5). In 1995, 79.8% ($66.0 billion) of the total ICT sectors' assets was held in the ICT services sector.

The ICT sectors' R&D expenditures

Between 1990 and 1995, R&D in the ICT sectors increased by 33.1% to over $2.5 billion (Appendix 2, Table 6). Most of this increase came from the ICT goods sector. The ICT sectors' R&D spending consistently accounted for more than one-third of total annual R&D spending in Canada. This was completely disproportionate to the ICT sectors' size in the economy as measured by GDP, revenues, profits or assets. For this reason among others, the ICT industries are considered important to Canada's future economic development and prosperity.

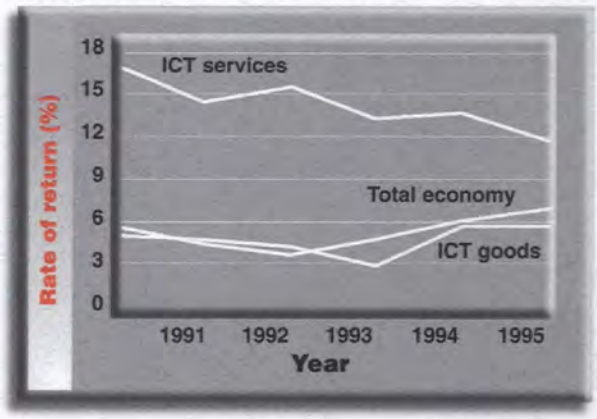


Figure 3
The ICT sectors' rates of return

Figure 4
The ICT services sectors' trade

Figure 5
The ICT goods sectors' trade

[11] Because of data gaps, this figure excludes a number of industries that are part of the ICT sectors (see Appendix 1 for a complete listing of industries); the following SICs are excluded: Services (483) and Goods (3341, 3368, 391)..

[12] Industry Canada, *The Telecommunications Service Industry: Trend Analysis, Canada-United States, 1980-1995*, January 1996.

The ICT sectors' trade

Trade in the ICT sectors was dominated by the goods sector. Although each sector was characterized by negative balances, the ICT services sector's exports grew faster than its imports, narrowing the sector's deficit (Figure 4). In contrast, despite strong export growth in the ICT goods sector (15.2% annual compounded rate), its imports grew even more, leading to an increased deficit (Figure 5). In 1994, the latest year for which data were available for both sectors, the ICT sectors' balance of trade deficit position was $14.7 billion (Appendix 2, Table 7).

1.1.1. A. ICT Services

The ICT services sector's GDP

The ICT services sector, consisting of the broadcasting industry, telecommunication (telecom) carriers and the computer services industry, contributed 4.8% ($26.2 billion) to GDP in 1995, up from 3.8% ($19.4 billion) just five years earlier (Appendix 2, Table 8). This growth was driven by the computer services industry and the telecom carriers, which grew by 58.9% and 33.0%, respectively, over the period. The rapid growth can be partially attributed to the impact of deregulation and to service and product innovations. In comparison, the broadcasting industry's contribution to GDP grew at a rate comparable to that of the economy (6.9% and 7.7%, respectively).

The ICT services sector's employment

The ICT services sector outperformed the economy in creating employment: employment in the sector increased by 18.7% over the study period, compared with 2.6% in the economy. The computer services industry was responsible for most of this growth: it posted an overall gain of 72.1% (Appendix 2, Table 9).

The employment structure in the ICT services sector continued to evolve over the period. The broadcasting industry experienced the greatest growth in operating revenues and profits, but its work force declined by 7.3%. However, the growth of employment in the computer services industry more than compensated for this decline. By 1995, employment in computer services was almost as important as in telecom carriers (Figure 6).

The ICT services sector's operating revenues and profits

All the ICT services industries showed remarkable growth in revenues over the period 1990-95 (Appendix 2, Table 10). The broadcasting industry experienced outstanding growth in profits: starting at $466 million in 1990, its profits increased at an annually compounded rate of 17.5% to $1,042 million in 1995 (Appendix 2, Table 11). As a result, its share of ICT services sector's profits stood at 22.3% in 1995, a two-fold increase over the period (Figure 7).

The strong revenue growth in the computer services and telecom carriers industries did not translate into comparable profit performance. The recession and competitive pressure deeply affected profit levels in the computer services industry: profits fell from $744 million in 1990 to $81 million in 1991 and, as of 1995, were at $628 million, below the pre-recessionary level (Table 11).

Telecom carriers accounted for the bulk of profits in the ICT services sector (Figure 7, Table 11), although their profits increased by only $50 million (3.5%) from 1990 to 1995, falling far short of the economy's performance. This resulted in telecom carriers accounting for a declining share of the ICT services sector's profits over the period.

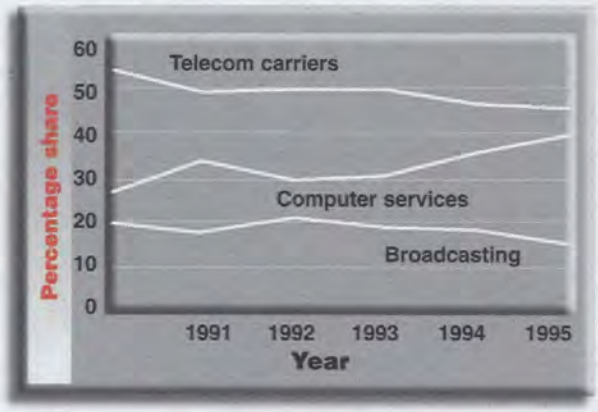


Figure 6
The ICT services industries' shares of the ICT services sector's employment

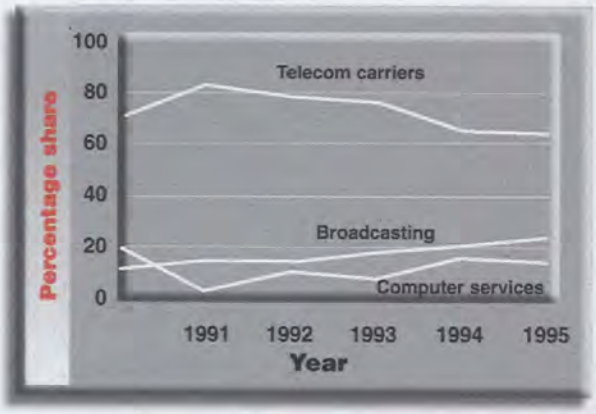


Figure 7
The ICT services industries' shares of the ICT services sector's operating profits

The ICT services sector's assets

As already noted and shown in Table 5, the ICT services sector's assets increased much more than the assets for the overall economy from 1990 to 1995. All the ICT services industries showed growth (Appendix 2, Table 12), with the broadcasting industry leading the sector.

The ICT services sector's R&D expenditures

R&D is an important determinant of productivity and growth in the economy. Although the ICT services industries are associated with leading-edge technologies, the growth pattern of their R&D expenditures was almost identical to that of other industries in the economy. However, the amount of R&D spending by the ICT services industries exceeded their relative size: the ICT services sector accounted for just 4.8% of GDP and 3% of revenues in the economy, but 7.7% of all industries' R&D expenditures (Appendix 2, Table 13). The disproportionate share of R&D spending was particularly apparent in the computer services industry, which accounted for two-thirds of the ICT services sector's R&D expenditures, despite being responsible for a little more than one-fifth of the sector's GDP, one-third of its revenues and one-tenth of its profits.

The ICT services sector's trade

Trade activity within the ICT services sector was robust and primarily attributed to the computer services industry. Two-way sectoral trade (combined exports and imports) grew from $2.0 billion to $3.3 billion over the study period (Table 14). Both exports and imports increased for the computer services and communications industries. Trade showed a chronic deficit over the 1990-95 period; however, the gap narrowed from -$352 million in 1990 to -$259 million in 1994, the latest year for which data were available. This change is mainly attributable to improvements in the computer services industry's balance of trade.

From 1990 to 1994, computer services exports almost tripled. This rapid growth in exports for computer services resulted in its share exceeding that of communications by 1994 (Figures 8, 9, 10 and Appendix 2, Table 14).

Figure 8
The computer services trade

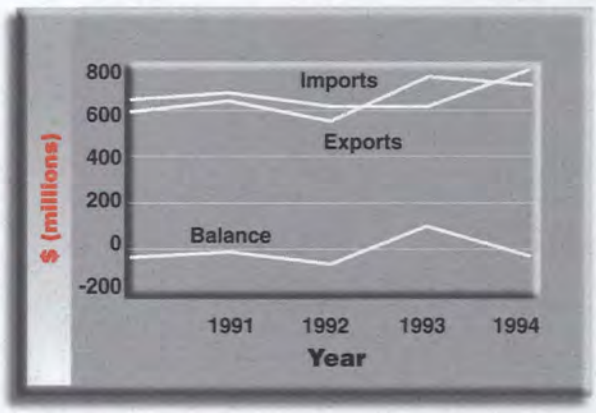


Figure 9
The communication services' trade

Figure 10
The ICT services industries' shares of the ICT services sector's exports

1.1.1. B. ICT Goods

The ICT goods sector's GDP

The recession, and restructuring brought about by freer trade and globalization, greatly impacted Canada's manufacturing sector. Given the turbulent environment, the performance of the ICT goods sector is noteworthy. Its contribution to GDP nearly doubled over the five-year period, growing from $5.3 billion to $10.8 billion and accounting for nearly 2% of GDP in 1995. This represented an annual compounded growth rate of 15.4%, ten times that of the economy. Nearly 80% of the change occurred after 1993, indicating that the ICT goods sector may be picking up speed.

Leading the ICT goods sector in GDP was the office, store and business machine industry, which overtook the communication and other electronic equipment industry in 1995. Its contribution to GDP increased 231.7% over the 1990-95 period and stood at $6 billion, or more than half (56.0%) of the sector's GDP, in 1995. Although the communication and other electronic equipment industry's growth — 40.6% — was not as remarkable, it grew over five times faster than the economy, contributing $4.6 billion to the economy in 1995 (Figure 11, Appendix 2, Table 15).

The ICT goods sector's employment

The impact of restructuring could also be seen in the decline in employment in the ICT goods sector from 1990 to 1995. Job losses were registered in the record player, radio and television receiver industry, which declined 62.1% (4,315 persons), and the office, store and business machine industry, which declined 30.7% (14,267 persons) despite its overall expansion in output. Two-thirds of the job losses took place over a one- year period (1990-91). Employment in this industry was relatively stable from 1994 to 1995 (Appendix 2, Table 16).

Employment in the ICT goods sector decreased by 8.2% over the entire period, but increased 11.1% between 1994 and 1995. In terms of the sector's share of total employment in the economy, these latest increases returned it to levels it had not achieved since 1993. The communication and other electronic equipment industry, largely associated with the new economy, created 10,078 new positions over the 1990-95 period. Continued monitoring of the employment situation to see whether recent gains can be consolidated and augmented will be important, as this would reinforce the traditional role of manufacturing in the Canadian economy.

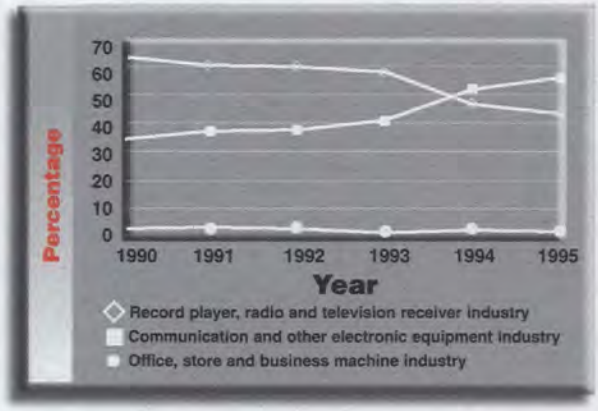


Figure 11
The ICT goods industries' shares of the ICT goods sector's GDP

The ICT goods sector's operating revenues and profits

After a small recessionary contraction, the ICT goods sector's operating revenues increased, closing the period 62.2% above its starting level (Appendix 2, Table 17). All ICT goods industries noted in Table 17 outperformed the economy, particularly the electronic computing and peripheral equipment industry (up 194.2%) and the electronic parts and components industry (up 90.8%).

The ICT goods sector's profits recovered more slowly than those of the economy as a whole, stagnating a year longer than those of other sectors in the economy. Advances were finally realized in the last two years of the study period; the sector closed the period with profits at nearly double the pre-recessionary levels. In contrast, profits in the economy finished the period 43.1% higher (Table 4, Appendix 2, Table 18).

Spectacular gains were achieved by the electronic computing and peripheral equipment industry: profits nearly quadrupled from 1994 to 1995, rising from $103 million to $398 million. Figure 12 shows how profits varied among the three industries representing this sector, and the increasing significance of those industries involved in the information economy.

The ICT goods sector's assets

The growth of assets in the ICT goods sector paralleled the growth of assets in the total economy. As a result, there was little change in the sector's share of total assets in the economy over the study period. The communication and other electronic equipment industry, holding 73.5% of the sector's assets, experienced the least growth, about one-third less than that of the economy, whereas assets increased 92.1% in the electronic computing and peripheral equipment industry (Appendix 2, Table 19).

The ICT goods sector's R&D expenditures[13]

The ICT goods sector was consistent in its R&D spending and a major contributor to R&D in the economy. It accounted for between 27.3% and 29.1% of total R&D spending during the study period. The telecommunication equipment industry was the sector's leader in R&D spending: expenditures grew 48.9% over the period and accounted for 53.5% of all the sector's R&D spending in 1995. The ICT goods sector's R&D spending patterns were comparable to those of the economy, and the sector's R&D spending continued to be almost 4.5 times greater than the GDP growth of the economy. In 1995, the total ICT goods sector's R&D spending reached almost $2.0 billion, up from $1.5 billion in 1990 (Appendix 2, Table 20).

The ICT goods sector's trade

A significant characteristic of the ICT goods sector was its trade activity. Starting at $9.6 billion in 1990, exports increased to $19.5 billion by 1995 (Appendix 2, Table 21). Imports grew even more from the base year, climbing to $35.6 billion from $18.2 billion (Appendix 2, Table 22). This gave rise to a large and growing trade deficit, particularly apparent in the electronic parts and components industry, whose deficit increased from $1.7 billion in 1990 to over $9.6 billion in 1995 (Appendix 2, Table 23). Especially noteworthy was the improvement in the trade balance of office, store and business machines from 1990 to 1995.

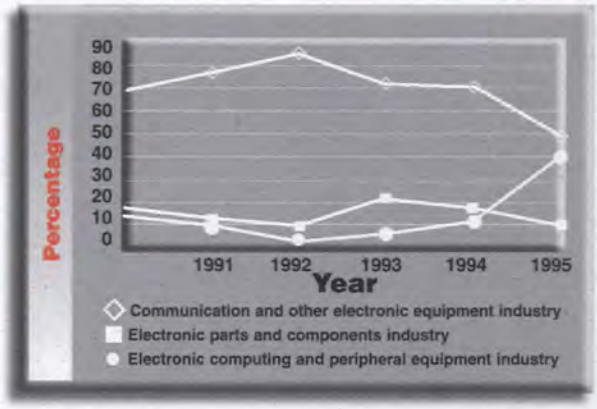


Figure 12

The ICT goods industries' shares of the ICT goods sector's operating profits

1.1.2 The Role of the Arts and Culture Sector in the Canadian Economy

A consensus is emerging that content (value-added products and services) provided through the infrastructure will be an important source of future growth for the GIS. Growth in the GIS will be driven by content developed throughout the economy.

In Canada, as elsewhere, the cultural and linguistic diversity of content is a key principle in the creation of the GIS.[14] It is critical for the development of a truly global information society that all peoples see themselves reflected in its products and services. Content, and the culture and language it reflects, will have important social and cultural impacts as the GIS changes and expands the way people interact. The arts and culture sector as traditionally defined, and including new industries being created by the multiple convergences of technology, will have a unique contribution to make to the creation of content in the GIS as both an economic and an employment agent and as a catalyst for cultural and linguistic diversity.

[13] R&D data for scientific and professional equipment are at a three-digit level and therefore include non-ICT industries (SICs 3913 and 3914). These industries, however, account for a negligible part of this SIC category's R&D expenditures.

[14] This is reflected in the G7 Principles for the GIS, the Asia-Pacific Economic Co-operation (APEC) Principles, and the Chairs' Conclusions form the Information Society and Development Conference held in South Africa in May 1996..

In Canada until recently, the arts and culture sector had not been considered an "industry" or "business," but rather had been treated as a unique area of the economy whose objectives were not primarily financial, and whose key value was its contribution to quality of life and shared national identity. The social value of the arts and culture sector is clearly important to society. However, in 1993-94 the arts and culture sector also directly contributed $29 billion (4.7% of GDP) to the Canadian economy. In the same year, this sector also employed almost 900,000 Canadians or 6.9% of the labour market. Cultural products and services are beginning to emerge that will be in increasing demand in the GIS and will only increase the economic significance of this sector in Canada.

1.1.2. A The Arts and Culture Sector

The arts and culture sector is not a traditional industrial sector and, although it may foreshadow what the GIS may look like, it does not easily lend itself to analysis using the framework of the System of National Accounts (SNA).

The arts and culture sector's GDP and employment

The Culture Statistics Program has undertaken to calculate the sector's GDP contribution using the standard primary inputs of land, labour and capital. Because these values have had to be calculated from first principles, the data are in current dollars as opposed to the constant 1986 dollars used elsewhere in this paper for presentation of GDP contributions. This work is still in its preliminary stage, and the current estimates for GDP and employment exist only for 1993-94 (Appendix 2, Table 24). These latest estimates use a working definition of culture that has undergone a number of important changes since previous studies. In addition, data on employment, which had previously been drawn from the 1991 census, are now extracted, where possible, from Statistics Canada's monthly Labour Force Survey. Despite these improvements, there are still some activities, such as location shooting by foreign film producers, that are not fully covered due to lack of data. In relation to the figures presented, however, these data gaps account for a small portion of activity.

The definition of culture used here includes the broadcasting sector, as well as the industry manufacturing record players, radios and television receivers. Data for these industries have also been included in the ICT services and goods sectors, respectively.

The arts and culture sector's operating revenues and profits

The data in the Statistical Appendices on revenues and profits have been drawn from the industry surveys carried out by the Culture Statistics Program. The exception is the data for broadcasting, which are the same as the data discussed as part of the ICT services sector.

Broadcasting accounts for the largest portion of the sector's revenues and has one of the highest rates of growth, but other areas also make significant contributions. The highest rate of growth, 70.8% over the five-year period studied, was reported by the film and video production industry, with the sound recording industry showing 45.5% growth (Appendix 2, Table 25). In 1993-94, revenue from both these industries approached $1 billion.

Broadcasting remains the most profitable industry, but film and video production and sound recording have also seen significant growth in their profits (Appendix 2, Table 26). These industries have also seen considerable increases in their exports, as demonstrated in the following section.

The arts and culture sector's trade

The SNA does not readily provide data on the balance of trade in cultural goods and services. However, initial research[15] undertaken by Statistics Canada for Canada's Department of Foreign Affairs, Industry Canada and Canadian Heritage indicates that exports of cultural goods and services grew from being only one-third as large as imports to being one-half as large as imports. The Canadian balance of payments in cultural goods and services (excluding cultural equipment and non-cultural business services) therefore indicated a shrinking deficit, dropping 5.4% between 1990 and 1995 to reach $3.1 billion (Appendix 2, Table 27).

Exports of cultural goods (excluding cultural equipment) increased by 125.8% overall to reach $1.2 billion in 1995 (Appendix 2, Table 28). This rapid growth in exports was diversified, occurring in almost all major cultural export sectors, such as publishing, film and sound recording. Commodity data from the Canadian International Merchandise Trade Statistical Program indicate that, between 1990 and 1995, exports of books increased by 151% to $246 million, films by 133% to $65 million and recordings by 324% to $111 million.

Although the value of imported cultural goods and services (excluding cultural equipment) was more than twice that of exports, the 24.3% increase over the five-year period represented less than one-third the growth rate for exports, which increased 82.7% over the same period to just under $3 billion (Appendix 2, Table 29).

[15] Statistics Canada, "Canada's International Trade Position for the Arts and Culture Sector: a working document completed for the Department of Foreign Affairs and International Trade, "March 1996.

1.2 Demand

Of increasing importance for developing concepts and performance indicators related to the GIS will be measurement of the use of ICT services, goods and content by residential and business end users. Statistics Canada has produced performance indicators for household usage for some time.[16] Recently, in co-operation with Industry Canada, detailed business-use indicators have been added.

1.2.1 Household Usage[17]

Canada has one of the most developed communication infrastructures in the world. As of 1995, 98.5% of households had telephones, 73.4% had cable television service (approximately 95% of Canadians had access to cable television), 98.9% could receive off-air broadcasting radio signals, 28.8% owned computers and 12.1% owned modems (Appendix 2, Table 30). On the basis of an analysis of existing data, Canada is well placed to join the information society.[18] However, the introduction of new technologies and a wider choice of services and goods increase the need for developing new concepts and service indicators better suited to the changing marketplace.

The increases in the numbers of computers and modems per household provide evidence of a move towards a GIS in which these are a basic requirement for accessing increasingly complex content. Complementary 1995 polling data indicated that recent purchasers of home computer systems planned to use those systems for work or educational purposes, essentially as word processors. However, they were in fact using them as part of a home entertainment system.[19]

Cable television and computers were more common among families with children. About 16% of individuals used one or more services on the Internet.[20] Analysis of the data revealed that computer ownership was increasingly a function of income (Appendix 2, Table 31) and that education was a major influence, independent of income. Further evidence of this group (higher income, higher education) accessing new communications opportunities was provided by the explosive growth in the viewing audiences of pay and specialty channels. In 1995, viewing of pay and specialty services accounted for almost 25.0% of all television viewing in English Canada, an 89.0% increase over five years.[21]

In order to use the information infrastructure, people need a certain level of computer literacy. Survey results showed that computer literacy varied by age. Those between 15 and 24 years of age were the most computer-literate, but levels remained high until the age of 54. However, computer literacy is only one element of the skills required to access the potential of technology. "Digital literacy skills," which enable people to understand, work with and creatively manipulate digital information and which help to ensure that there is the capacity to create, distribute and use digital content, are likely to become a basic requirement for future individual participation.

The proportion of households with access to communication technology also depended on location, family size and employment status. Urban households, for instance, had greater access to cable than those in rural areas, irrespective of income, education or other variables. Some forms of access, such as by satellite, were not included in the analysis.[22]

[16] Statistics Canada, *Household Facilities Survey*, Cat. No. 64-202; *Annual and Monthly Telephone Survey*, Cat. No. 56-203; *Cable Television*, Cat. No. 56-205.

[17] Dickinson 1996; Sciadas 1996.

[18] Dickinson and Sciadas 1996.

[19] Angus Reid Group Inc. 1995.

[20] Nielsen Media Research 1995.

[21] Kiefl 1996

[22] Dickinson and Sciadas 1996.

1.2.2 Business Usage

A 1995 study found that business usage of telecommunication services varied by service, goods, size of firm and industry. All firms used local telephone services. Facsimile and long-distance services were also used extensively. New services, such as those accessible through the Internet, were fast becoming popular and necessary as firms strived to increase their competitiveness through communication networks (Appendix 2, Table 32).[23]

The significance of the information economy is increasing as new technology improves the communication infrastructure and as industries that provide content through that infrastructure continue to expand. The government and business sectors are increasingly developing value-added information services and goods, such as tele-education, tele-medicine, electronic banking and tele-shopping.[24] Even in a country as "wired" as Canada, few of the social, financial and economic impacts of these services and goods have been quantified. There is an increased awareness of the need to augment existing initiatives to measure these impacts; case studies are being undertaken in many areas.[25]

Canada's advanced ICT services, combined with its traditional strengths in digital ICT equipment, systems integration, software and other content developments, put it in a good position to create and market the applications and goods that will form the basis of its GIS. A greater challenge today is posed by the need to quantify and evaluate usage by residential and business users and the impacts that increased choice in ICT services and goods has on the financial viability of ICT service providers.

Statistics Canada, in collaboration with Industry Canada, has developed a model that situates future demand-side surveys within the context of an economy-wide analysis (Figure 13).[26] As more ICT services and goods are introduced in the marketplace, new concepts and performance indicators are required to measure the social impacts on end users. Extending demand indicators to incorporate demographic variables has already taken place. However, data on differences by demographic variable in the way end users regard ICT services and goods as substitutes for and complements to their existing ICT usage have generally not been made public as most of the data are proprietary. Nor has there been much information on how the usage of ICT services and goods in the workplace impacts ICT usage in the home. Usage data linked with relevant employment statistics would provide insight into how ICT usage improves a person's knowledge-based skills and job prospects. The OECD is increasingly aware of the need to focus more on this type of analysis if policy makers are to find solutions to employment issues.[27] Canada has commenced work in these areas as well.

A related issue is the development of concepts and performance indicators related to prices paid by residential and business users. As competition increases, so do the demand for and supply of discounted and packaged ICT services and goods in the marketplace. Statistics Canada, in collaboration with ICT service providers, has commenced a review and update of the consumer price indices for local and long-distance telecommunication services to reflect new services and goods that currently are not being measured. Promising work has begun on methodological and practical ways of constructing business-use price indices, which have not existed in the past. These initiatives are essential for accurately developing suitable deflators and for providing policy makers with a measure of the impacts of competition on prices paid by end users.

While existing data are useful to policy makers, technological advances, especially in wireless communication services and goods, will increasingly have a profound impact on past measurements. Most countries measure universal telephone service on the basis of the number of main lines per population. In North America, the data have been supplemented by the number of access lines per population and the number of households with or without certain ICT equipment. The data say little about the usage or quality of ICT services and goods. Nor do the data provide insight into the usage of enhanced services, such as electronic banking, that are provided by other industries in the economy. Several recommendations can be made:

[23] Mozes and Sciadas 1995.

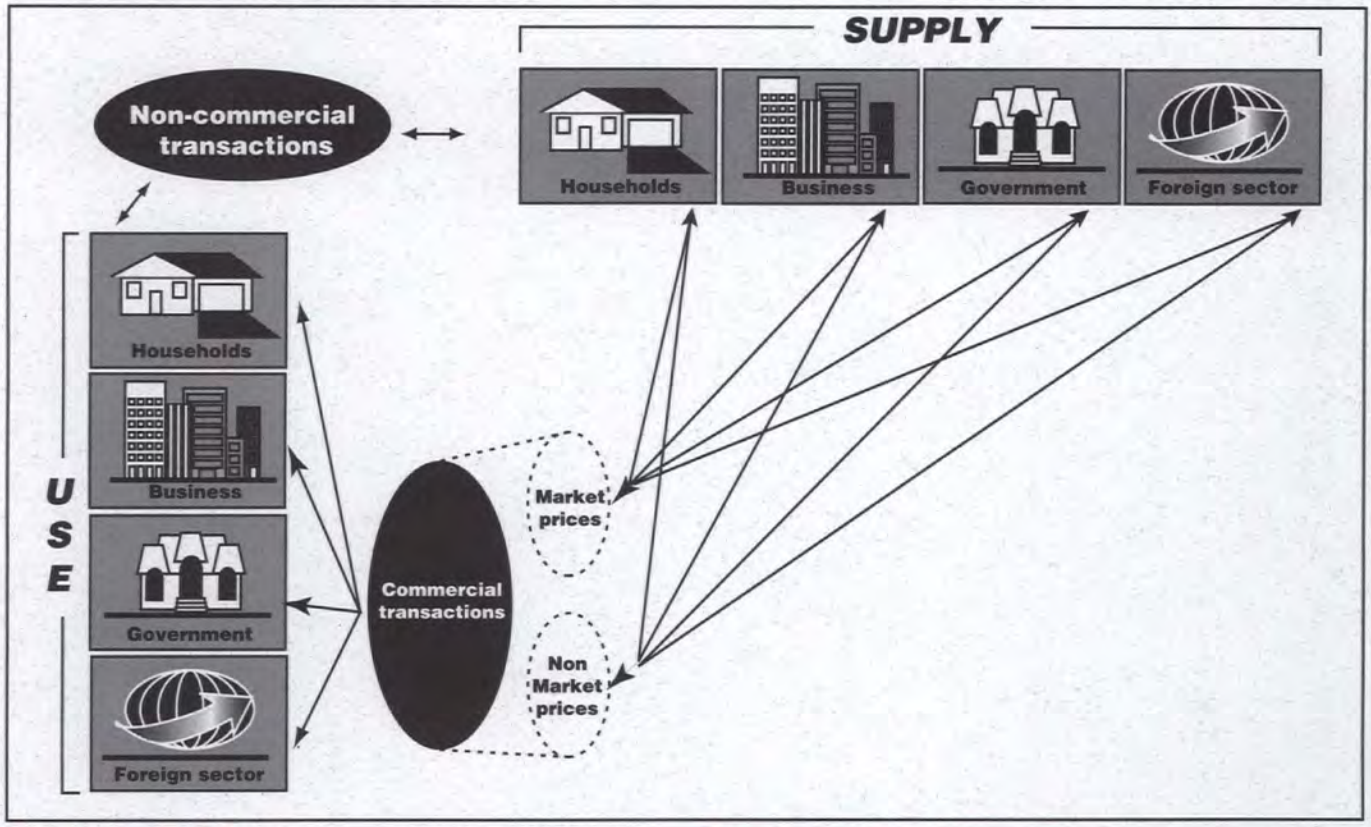
[24] The G7 pilot projects, first endorsed by the G7 Ministers in Brussels in February 1995, advanced the use of ICT and related innovative technologies by governments and businesses.

[25] Industry Canada and Statistics Canada, in collaboration with financial institutions, are in the process of designing a survey to measure the demand for communication services and the supply of electronic banking services, to be completed in 1997.

[26] Sciadas 1996.

[27] OECD Workshops on the Economics of the Information Society in Toronto, Istanbul, Tokyo and Helsinki addressed these and related issues.

Figure 13
Economy-wide intersectoral transactions model



For households

- Infrastructure data collection should continue and become more detailed.
- Measures should be expanded to include software and the usage of new ICT services, goods and content, such as the Internet.
- Price measures must be constructed to complement existing telephone price indices.

For businesses

- On the supply side, existing statistical infrastructures, such as main lines per population, should be augmented to measure access to the GII and information flows.
- On the demand side, new surveys are necessary to take account of increased choice in ICT services and goods.
- Price measures, preferably by firm size, must be constructed.
- Indicators are needed on the availability and use of enhanced services, such as electronic banking and tele-shopping.

For governments

- Indicators are needed on the availability and use of government ICT services and enhanced services, such as tele-education, tele-medicine, tele-health and electronic filing of tax returns.
- Detailed infrastructure statistics for schools, together with their costs and usage, are needed.
- Measures of ICT services available from health-care facilities and hospitals should be constructed.
- Quantification of ICT services and content provided through libraries and by arts and cultural institutions is needed.

Such data measures will facilitate international comparisons that can lead to an assessment of the relative position of countries at various stages of GIS development.

Section 2

New Performance Indicators

Section 2
New Performance Indicators

2.0 Introduction

A GII-GIS, including the ICT and arts and culture industries, is evolving worldwide in the wake of technological advancements and regulatory reform. How can the impacts of this information revolution be measured?

As Canada evolves as an information society, new industries are springing to life. The adoption of new technologies, and the application and use of new services, goods and content are changing the nature of organizations and the relationship of existing industries to the information economy. Keeping track of these changes and analyzing activities within old and new industries alike are complex statistical tasks. The full impacts of the GIS on society will be understood only when the associated economic, social and cultural implications of the GII are analyzed. The following section proposes new performance indicators for the GIS, based on existing data and frameworks, modified where appropriate, as a contribution to the development of a coherent picture.

2.1 The Purpose and Use of Performance Indicators

An underlying assumption in data collection is that statistical data will satisfy the basic requirements of the SNA, used to measure the performance of economies worldwide. To conform to SNA requirements, data must be collected that measure production, price, quantity, trade, capital investment and employment. The consequences of technological change can be assessed by using these data to estimate changes in productivity. Such data may also be used for regulatory purposes, from ground rules to ensure dynamic competition to complex systems intended to govern fully regulated industries. New measures will assist in determining a fair price for services and goods in a GIS and could help ensure active participation by consumers and producers in a diverse marketplace.

A range of conceptual frameworks is needed both to satisfy economic, technological and regulatory data requirements and to address various social impacts and issues related to jobs, the nature of work, unemployment, training and retraining, and education.

2.2 The Role of Policy Makers

Rapid changes in the workplace, accelerated as they are by the GII-GIS, present policy makers with a number of complex issues, and their interrelationships call for an integrated approach. Policy makers need to work closely with statistical agencies to determine how performance indicators can be used to quantify the impact of social and economic policies, and to ensure not only that ongoing statistical frameworks and data collection programs remain relevant and timely, but also that new ones are initiated when required. The GII-GIS policy initiative is a good example of the need to review existing frameworks and establish a joint policy-statistical program for the development and establishment of performance indicators.

Canada launched a program to respond to policy needs in September 1995.[28] Its development is expected to span three years, after which ongoing data gathering related to the GII-GIS will be incorporated within the existing statistical framework of Canada's central statistical agency, Statistics Canada. In Canada, data on the information society will include:

- measures of the use of information and communication services and goods by individuals, and the economic activities of firms that use and produce information and communication services and goods;
- statistics on education, health and social issues, and family expenditure;
- statistics on business and trade, including measures of value added, capital formation, income and expenditure, and trade, as well as input-output estimates by industry, measures of employment and unemployment and labour income by industry and region.

[28] Mozes and Sciadas 1996.

2.3 Frameworks for GII-GIS Measurements in the Future

Although there is much discussion of the impacts of the information infrastructure and the convergence of its underlying technologies, data and analysis are necessary to ensure that the intensifying policy debate concerning the transition to an information society is informed.[29]

Measurement of the information society is complex, if inputs to economic and social activities are to be linked to outcomes and if the measurements are to prove useful for developing policy. In addition, for the results to be internationally comparable, the measurements need to be developed and analyzed in close collaboration with the users of the data and, ideally, with statisticians from other countries, with co-ordination by international agencies such as the OECD and the International Telecommunications Union (ITU). For this to happen, the measurements must have a conceptual framework[30] within which analysis can be conducted.[31]

2.3.1 Framework for Measurements of Socio-Economic Impacts

Services and goods in an information economy will become more readily accessible to mass markets as the interoperability and interconnection of numerous information and communication networks improve and enhance the GII. This does not mean that all the services and goods will be new. However, without the networks, it will be difficult to consult specialized databases, facilitate collaboration or create virtual firms.

As the GII-GIS evolves, content and software will be produced throughout the world. This will have implications not just for trade and production, but for the educational infrastructure that produces skilled workers and the organizations that employ them. The ready availability of services on the GII will advantage the industrialized countries that produce, codify and market information, for example, in the form of databases and distance learning using video and multimedia methods, and electronic data interchange of all kinds. For policy makers, this gives rise to a number of concerns that will require quantitative as well as qualitative analysis. For example:

- the extent to which people have adequate access to training and education to enable them to use ICT services, goods and content to their individual advantage, which in turn will contribute to socio-economic growth;
- the extent to which policies that stimulate R&D, competition and innovation result in the introduction and use of user-friendly ICT services, goods and content that minimize the need for extensive training;
- the extent to which consumers, governments and businesses are making use of ICT services, goods and content to increase their competitiveness.

In labour market analysis, there is no framework comparable to the SNA that brings together measures of employment and unemployment and the inventory and movement of qualified people. Nonetheless, there are tools in the form of occupational and educational classifications, and additional measures of employment, such as employment status, age, gender, mobility and work activity. Work is also under way under the auspices of the OECD/Eurostat to measure flows of skilled workers.[32] These tools can be used to examine changes in, or resulting from, the information economy. While such indicators can be used to report on economic and social change, some may be used by regulators to effect change.

2.3.2 The SNA

The SNA framework is used by statistical agencies for collecting data from businesses directly (or from administrative sources) to estimate value added and, therefore, GDP figures, as well as capital investment and labour, the volume of trade in services and goods, quantities of goods produced and their prices.[33] Data on quantities and prices are used to establish price indices, which are then used to estimate real domestic product and real growth rates. Within the SNA, an economy can be classified by industry, by region or by other measures, such as the growth rate or turnover of firms or their age. The body of data integrated in the SNA contributes to the making of economic policy and has done so for the last 50 years.

Criticized for its approach and omissions, the SNA is now revised regularly. The most recent revision was made in 1993 through the collaboration of many international organizations under the auspices of the United Nations.

[29] OECD, *Workshops on the Economics of Information Societies: Workshop No. 1*, June 1995.

[30] Gault, "Discussant's Report," December 1995.

[31] Gault, "Canadian Statistics on the Information Society," 1995.

[32] Eurostat 1996.

[33] Four papers presented at the OECD Workshops on the Economics of the Information Society that fit within the SNA framework are those by Bayar, Courcoubetis, Gärdin and Keser.

2.3.3 Framework for Measurements of Technological Change

Measurement of technological change is not an objective of the SNA, but it is becoming more common for statistical agencies, as the results are of increasing interest to the makers and evaluators of social, industrial and science policies. However, there has to be a classification of the commodities to be measured and, ideally, the classification must be applicable internationally.

In examining technological change and measuring the impacts of the GII-GIS, several basic questions need to be posed: how far has the technology penetrated, at what rate is it diffusing, and what are the social and economic impacts?

Much of the information on services and goods comes from suppliers. This is particularly true of the telephone companies and broadcasters, which monitor sales of their services and goods both for themselves and for their regulators. However, this information does not indicate which consumers, governments and/or business sectors are using (or are planning to use) particular services, how this use varies across industry, firm or region, or how this use influences the management practices or labour requirements of any firm.

Questions addressed directly to firms and households can furnish this information and can provide a direct input to the policy process. In addition, a question about use and planned use addressed to firms can be followed by related questions about the availability of a labour force sufficiently skilled to develop and work with the technology, the need to train and retrain, and the benefits of the adoption of technology and potential reductions in the unskilled labour force and of more effective internal organizations. This suggests that technology-use indicators will be useful in guiding social and industrial policy in the GIS and in monitoring the activities of regulated industries.[34]

2.3.4 Framework for Regulatory Measurements

All markets in industrial countries are regulated to some extent, if only to ensure dynamic competition and protection of the consumer from the misuse of power. There is also regulation of resources held in common, such as spectrum management in broadcasting and radio communications. The regulatory environment is changing, and competition is increasing, both domestically and globally.

With globalization, it is increasingly difficult to regulate a domestic market in a manner that differs substantially from that of neighbouring countries. Regulatory and legal frameworks differ from country to country, but policy makers need data that go beyond national accounting requirements. Regulators are interested in industrial concentration, pricing policy, efficiency in service delivery and access to that service. Regulation may also deal with the content of the information provided.

2.3.5 Framework for Measurements of Content and Culture

A basic principle of the GIS is the assurance of cultural and linguistic diversity in content. The services, goods and content available on the GII must reflect the needs of people using the GII. Policy and regulatory questions are arising around such issues as access to basic and essential information services on the GII. The transactional nature of the GIS necessitates multilateral discussions about such issues as privacy, fraud, hate programs, violence and pornography transmitted on the GII, for example, on the Internet. The GII is also creating challenges to the frameworks governing intellectual property.

National identity, social cohesion and cultural sovereignty may also be a concern. In the case of Canada, for example, the objectives of the 1991 Broadcasting Act include ensuring that the Canadian broadcasting system is effectively owned and controlled by Canadians, operates primarily in English and French and comprises public, private and community elements. The system is expected to encourage the creation and presentation of Canadian content by providing a wide range of programming that reflects Canadian attitudes, opinions and values. As well, the 1993 Telecommunications Act calls for the orderly development throughout Canada of a telecommunication system that serves to safeguard and strengthen the social and economic fabric of Canada and its regions. This same system, of course, will be the conduit through which other nations' opinions, attitudes, priorities and commerce will be brought into the country.

Measuring the social impact of content requires, in addition to financial and economic data, the collection of information on language, authorship, nationality, and region of origin and of use, all of which constitute cultural indicators. Again, no internationally agreed framework comparable to the SNA exists for cultural statistics. There is a need for indicators of cultural activity if the full impact of the information economy is to be measured.

[34] Motohashi 1995; Mozes and Sciadas 1995.

2.3.6 Framework for Measurements of Employment and Productivity[35]

Industries are operating in an environment of rapid change (demographic, market and societal), accelerated by ICT. The central role of new technologies as determinants of economic success and societal well-being is irrefutable. More than ever, the ability to develop and harness technology depends on the availability and quality of a skilled work force. Technology as a sole agent will not increase productivity; technology alone will not destroy or create jobs. The pivotal factor is the human factor.

Conventional economic work force analyses provide insight into employment issues spurred by the GII, but they do not capture the full impact of ICT. Reliance on traditional measurement tools for new employment challenges has fuelled great debate, but has provided limited insight into the impact of ICT on employment.

For several years now, Canada and its colleagues at the OECD, the European Commission (EC) and Eurostat have been developing and testing an innovative approach to work force analyses that will provide insight and equip people with tools to address qualitative and quantitative information related to employment and the GIS. At the close of 1995, the EC and the OECD released a Manual on the Measurement of Human Resources in Science and Technology (the Canberra Manual), a vital member of the Frascati family of manuals, a "series of OECD manuals dealing with the measurement of scientific and technological activities started from the view, which underpins the whole idea of science and technology policy, that we can identify a set of activities which, though embedded in the cultural, social and economic systems of individual countries, call upon specific scientific and technological knowledge, skills and methods and contribute in a special way to social and economic progress."[36]

However, the Frascati exercise made it clear to Canada that there is a need to go beyond occupation analyses, to move away from a focus on "level" of skills and consider also "types" of skills. Canada is expanding its information on employment and occupation growth to include skills composition and its transition. As one of the first countries to test the application of the Canberra Manual's new methodologies, Canada is exercising some freedom in the way those methodologies are applied.

For example, Canada's 1986 Census isolated science and technology workers for the first time. So far, Census data have been limited, as they furnish information on formal education (highest attained) only and are collected only once every five years. Data for 1991, therefore, are the most recent available. Once the 1996 Census is released, the analyses will be expanded to provide an up-to-date Canadian picture. In addition, Canada is augmenting its census information base with data from graduate surveys, professional associations and private industry.

As part of its contribution, Industry Canada presented preliminary research findings at the OECD Workshop on the Economics of the Information Society in June 1996.[37]

First and foremost, it is clear that extending work force analyses to include indicators of educational skills, including level of education and specialization, opens a significant new window on the questions surrounding the transition to a knowledge-based economy. Current concepts of the knowledge-based economy suggest the following:

- The higher the educational attainment and skills level, the lower the level of unemployment. Yet, while supporting this assertion at a general level, this new research suggests that:

(a) Unemployment rates cannot be explained by level of educational attainment alone. There is great variation in unemployment rates within the fields of specialization.

(b) There is evidence that clerical jobs, traditionally occupied by those with lower levels of educational attainment, are being occupied, to an increasing degree, by people with post-secondary qualifications, and that people with higher education may be displacing high-school graduates. This raises questions as to whether post-secondary skills are required, and whether the skills of college and university graduates are being used to the best advantage. It also raises the issue of a readily available supply of college and university graduates controlling "computer literacy" in the workplace, and perhaps damaging the onus on firms to train and upskill their less-educated workers.

(c) There appears to be an oversupply of graduates in some fields. Is this because unemployment in certain fields is on the rise due to lack of employment opportunities or is it because of the quality and choice of field of education?

[35] Hansen, *Developing Indicators on the Technical Capacity and Innovative Potential of the Work force*, 1996.

[36] OECD, *Canberra Manual: Manual on the Measurement of Human Resources in Science and Technology*, 1995.

[37] Hansen, "Information and Communication Technologies: Initial Results on Skill and Employment Linkages," 1996. Three other relevant papers presented at the OECD Workshop were those by Bresnahan, Brynjolfsson and Grundberg.

- There has been growth in the number of jobs in the services sector and a loss in manufacturing, indicating a shift to more knowledge-intensive ways of making money. Yet, the findings of this research suggest that:

  Occupations classified in the services sector may include some previously credited to manufacturing, although the activities (jobs) of workers remain unchanged. This could lead to an overestimation of the growth of employment because of classification methods rather than actual job loss or creation. For example,

  (i) Assembling of computers and components is classified under manufacturing (fabrication and assembling of goods) and/or services (computer consultants).

  (ii) As industries turn to outsourcing, engineers move from occupations in natural sciences and engineering in the manufacturing sector to consulting engineering, classified under business services in the services sector.

- Levels of educational attainment are rising, indicating a shift to a more knowledge-based economy. Yet, people in the work force with higher levels of educational attainment are being employed in a variety of occupations, including clerical. Are the skills that these people possess being used to best advantage?

The rapid development of the GII-GIS may well be reflected in the results of Canada's latest census, which will certainly give Canada an opportunity to compare its experience with that of its global market partners. Further, the assessment of the impact of the GII-GIS on employment across the nation will allow the refinement of information provided to policy makers and business leaders.

Canada will continue to develop new indicators to track linkages between technology and employment. Industries under consideration are those showing rapid growth, including telecommunication carriers, computer services and heavy users of ICTS. Canada will also be looking carefully at the traditional sectors, such as manufacturing and finance.

To summarize, existing performance indicators need to be reviewed and analyzed, as highlighted in Section 1. Such an analysis will provide insight into what new performance indicators are required. Suggestions have been provided in this section. However, new industry classifications, which will reflect the rapid changes in the industries that form the basis for the GII and the emergence of the GIS, also need to be developed.

Section 3

The Information Economy in the 21st Century

Section 3
The Information Economy in the 21st Century

3.0 Introduction

Growth of the GII-GIS will be based on the creation and delivery of content to consumers, businesses and governments. The employment opportunities associated with this content will emerge in many industries outside those defined as ICT industries today. This section provides new definitions and classifications for the 21st century, which will better reflect the rapid changes in the ICT and content-producing industries, including the arts and culture sector. These definitions and classifications are based on those recently agreed to in North America and may, with further refinements, be extended to other regions of the world.

Quantifying the impacts of the GIS and the particular nature of the economics of the GII is difficult for three reasons. First, numerous definitions of the GII-GIS are used around the world. Second, while the costs of the information infrastructure are measurable, few of the benefits are quantified. Finally, any assessment of the full impact of the GII must include the impacts on society, national culture and global pluralism. The implications of the GII for these critical dimensions of the quality of life are only beginning to be understood.

Solutions to these difficulties are being developed. Canada, in co-operation with other countries and international organizations such as the OECD and the ITU, is continuing efforts to refine definitions and develop performance indicators. In 1997, North America will adopt a broad definition of the information industry, the NAICS.[38] Tables 3.1 through 3.4 provide an overview of the NAICS definitions to be used in North America for the information and related industries. This is an important step in developing statistics that will better measure the services, goods and content of the information economy.

Adoption of these definitions may modify data presented in Section 1 of this paper. The necessity of comparing data on the basis of different definitions and classifications will be minimized by the development and use of appropriate concordance tables. The following discussion outlines the NAICS definitions that will assist in advancing the measurement of the GII-GIS.

Table 3.1

Sectors of the economy relevant to the measurement of the GII-GIS, 21st century

1. ***Information and cultural industries***
   - Broadcasting and telecommunication
   - Information services and data and transaction processing
   - Publishing
   - Motion picture and sound recording

2. ***Computer and electronic product manufacturing***
   - Computer and peripheral equipment
   - Communication equipment
   - Audio and video equipment
   - Semiconductor and electronic components
   - Navigational, measuring and control instruments
   - Manufacturing and reproduction of magnetic and optical media

3. ***Performing arts, spectator sports and related industries, heritage institutions, recreation, amusement and gambling***
   - Performing arts, spectator sports and related industries
   - Heritage institutions
   - Recreation, amusement and gambling

[38] Information on obtaining a copy of the NAICS can be obtained from Statistics Canada or the Internet web site given in note 7. Concordance tables between the 1997 NAICS and the existing SIC are also available from Statistics Canada.

3.1 Information and Cultural Industries[39]

The information age transforms information into a commodity that is produced, manipulated, distributed and used by an increasing number of industries. In the 21st century, the information and cultural industries will be core industries, which will build and maintain the infrastructure and provide content for the GIS (Table 3.2). Their activities can be grouped into three types: those concerned with creating, producing, manipulating and distributing information and cultural goods; those that provide the means to transmit or distribute these goods, as well as data or communications; and those that process data or transactions.

"Content," which will be facilitated by the information infrastructure, consists of services (or value added to data) and goods created by the packaging of information in a way that makes it useful or desirable. It may take various forms, such as knowledge bases, programming (television/film), multimedia (print, video, graphics, sound, music, animation, etc.), courses for education and training, and interactive television ("infotainment"), to name a few.

The creation of the GII and the emergence of the GIS through the ongoing development and expansion of broadcasting, cable television, telecommunications, satellite and other communications are changing the way people interact and how businesses conduct their activities.

As a result of new technologies, "content pieces" can be developed in many different places and integrated in a final service or product form. Content must be created, produced, distributed, marketed, retailed and purchased. All this will take place in a new industrial chain linking players from many different traditional sectors, as they come together to deliver new products and services in the GIS. The GII-GIS will provide a new platform for creators and entrepreneurs to develop information and content products and services for domestic and global markets. Existing software and computer services industries, and cultural content providers (publishers, broadcasters, audio-visual and sound recording producers) are entering new markets and exploiting new opportunities, as they create products complementary to their traditional activities and develop new content-based businesses.

The business sector has a prominent role as a provider and user of content on the GII, as more and more industries make use of technology to serve their customers. For example, banks provide their customers with more choice and convenience through electronic banking services. Retail outlets have instant on-line inventory control. Increasingly, many manufacturers are using the GII as an integral part of their design and assembly systems. There are also many businesses that specialize in producing pre-packaged training and education content, or other information content, that can be purchased by consumers either in stores or on-line.

Table 3.2

Information and cultural industries (NAICS)

The ***Broadcasting and Telecommunication Industries*** include establishments primarily engaged in the operation of radio and television broadcasting studios and facilities or of telecommunication networks. Resellers of telecommunication services are also included in this subsector.
The ***Information Services and Data and Transaction Processing Services*** are subdivided into two industries: the Information Services industry group includes those that provide, store or provide access to information; and the Data and Transaction Processing Services industry group includes those that process data and transactions.
The ***Publishing Industries*** are engaged in the publishing of newspapers, periodicals and books, as well as database and software publishing. In general, publishers issue copies of works for which they possess copyright for sale to the general public, in one or more formats including traditional print form, CD-ROM and on-line. Publishers may publish works originally created by others for which they have obtained the rights, and/or works that they have created in-house.
The ***Motion Picture and Sound Recording Industries*** are involved in the production and distribution of motion pictures and sound recordings. While motion pictures and sound recordings are also "published," the processes involved are sufficiently different from those of traditional publishing industries to warrant a separate subsector. The production and distribution of these goods involve a more complex process and several distinct industries.

[39] According to the NAICS Agreement, cultural goods are identified as those that directly express attitudes, opinions, ideas, values and artistic creativity; provide entertainment; and offer information and analysis concerning the past and present. Also included in this definition are popular, mass-produced goods and those cultural goods that normally have a more limited audience, such as poetry books, literacy magazines and classical records.

The arts and culture sector, as traditionally defined and including new industries (e.g., multimedia), will continue to be critical to the development of content in the GIS. Electronic newspapers, worldwide on-line news services (e.g., Reuters), CD-ROMs, on-line access to heritage institutions and video-on-demand are all illustrative of the integration of a critical mass of creators, producers and business leaders in the creation of content.

Another content provider is clearly the government sector, as all levels of government increasingly create content for the GII as an alternative means of service delivery to the general public. Such government services include electronic information assistance and electronic submission of tax forms.

Another defining factor is the interactive nature of the new ICT. This provides each consumer with the opportunity to act also as a producer, creating (and perhaps sharing with others) a unique piece of content. The relative ease of creating home pages or on-line magazines on the Internet is a case in point. Interactivity is thus having a major impact on the information and content available; the mass market media or mass retailing of the past few decades are being replaced by tailored and targeted products and services — content. The full economic and social potential of the Information Society will be realized only when the products and services provided through the technology are created and used locally by the public, institutions and corporations.

3.2 Computer and Electronic Product Manufacturing

Many existing software and hardware manufacturers will continue to provide and sell the equipment required to build and access the GII. Most of the changes in these industries will be related to innovative methods of inventing, developing and manufacturing new software applications, services and goods (Table 3.3).

Many previously unknown growth industries will emerge to satisfy the application needs of niche markets. Two examples are multimedia and electronic commerce.[40] It is anticipated that many such applications will be subsumed into the ongoing activities of existing industries, making a significant contribution to the value of their core services and goods.

Table 3.3

Computer and electronic product manufacturing (NAICS)

Computer and Peripheral Equipment Manufacturing consists of the production of computers and associated goods, such as storage devices and monitors.
Communication Equipment Manufacturing includes the manufacture of telephone apparatus, and radio and television studio and broadcast equipment.
Audio and Video Equipment Manufacturing covers household and commercial radios, televisions, video equipment and similar articles.
Semiconductor and Electronic Components Manufacturing includes the manufacture of a broad range of components used as parts in this subsector. The loading of circuit boards is classified here.
Navigational, Measuring and Control Instruments Manufacturing includes the manufacture of such goods as radar and sonar equipment and industrial process control equipment.
Manufacturing and Reproduction of Magnetic and Optical Media includes the production of media such as video tapes and CD-ROMs, and the mass duplication of these media.

[40] A number of papers on multimedia and electronic commerce were delivered at the OECD Workshop on the Economics of the Information Society held in Tokyo in 1996. They are listed in the workshop proceedings, available from the OECD.

3.3 Performing Arts, Spectator Sports and Related Industries, Heritage Institutions, Recreation, Amusement and Gambling

The arts and culture industries will continue to be important to consumers for providing entertainment, performing arts and other such content, through which people can celebrate and explore their own cultural and linguistic identities. Technology will also enable heritage institutions to provide content for the GII as more events and collections are taped, broadcast or uploaded.

Creators of a diversity of content will become increasingly productive as computers and television, with their wide range of programs, are adopted as tools for delivering recreation-, amusement- and gambling-related activities to the general public (Table 3.4).

Table 3.4

Performing arts, spectator sports and related industries, heritage institutions, recreation, amusement and gambling (NAICS)

Performing Arts, Spectator Sports and Related Industries include those that produce or organize live presentations involving performances by actors, singers, dancers, musical groups and artistes, athletes and other entertainers. They also include independent entertainers and those who manage their careers.

Heritage Institutions include those engaged in the preservation and exhibition of objects, sites and natural phenomena of historical, cultural or educational value. The four industries of this subsector are Museums (including art museums), Historic and Heritage Sites, Botanical and Zoological Gardens and Other Heritage Institutions.

Recreation, Amusement and Gambling consist of three industries. The Sports and Recreation Facilities group includes those who operate and provide access to facilities where patrons can actively participate in sports and recreational activities. The Amusement Facilities group contains those who operate and provide access to sites and facilities primarily used for amusement purposes. Finally, the Gambling Industries group includes operators of casinos, lotteries, bingo halls and others primarily engaged in gambling-related activities.

3.4 The Importance of the Information Infrastructure

The information infrastructure is important for consumers, businesses and governments, as ICT are increasingly "embodied" in all services and goods produced in the economy. This is referred to as the "enabling effect" of the GII.[41] The degree of reliance on the information infrastructure has led to the production of new services, goods and content by suppliers and to the birth of new growth industries and employment creating the emerging GIS.

The infrastructure allows for new services, goods and content to be brought to the marketplace faster and to be delivered to more consumers because of the GII's ability to overcome barriers of distance and time. This in turn increases an industry's responsiveness to its clients.

When the underlying technology of the GII is optimized, productivity and competitiveness increase. For example, 1-800 and 1-888 numbers and call centres allow consumers to make travel arrangements or hotel reservations outside regular business working hours and often directly from home using a telephone or personal computer. The same is increasingly true for government services. Governments and businesses need not keep all their offices open at all times to provide the services their clients demand.

A final important feature of the GII and the content it carries or creates is that it has enabled close communication and sharing of ideas between people at home and abroad.

Each of these changes serves as a reminder that the nature of work itself, the skills of the labour force and the habits of consumers must adapt if the new opportunities are to be turned to advantage. These issues are now being addressed by consumers, businesses and governments everywhere.

[41] Evidence from studies on the use of information and cultural goods by the manufacturing and service industries clearly indicates an increase in the "embodiment" of these goods in other final services and goods. The speed of adoption and the magnitude of such embodiment differ by industry, as well as by size of firm or company.

Section 4

Future Directions for International Co-operation

Section 4
Future Directions for International Co-operation

4.0 Introduction

Simply put, the GII-GIS provides increased growth, productivity and employment opportunities. These benefits are widespread throughout the economy and are not limited to the ICT and arts and culture industries, which are usually credited as the media for (if not the catalysts of) the development of the information infrastructure, services, goods and content.

The 21st century will usher in many value-added information services, goods and content, produced in all sectors of the economy (e.g., electronic banking, distance education, home shopping and tele-medicine). The underlying information infrastructure of the ICT industries must be measured, barriers identified, and policies and regulations developed, based on empirical evidence and supported by performance indicators.

The Canadian information industry is in transition, and the growth and competitiveness of the Canadian economy are at stake. Policy makers are asking more questions than there are quantitative answers. Yet, policy makers cannot ignore the need nor wait until hard data are available before making appropriate policies and regulations.

Through a series of OECD-sponsored workshops, discussions are taking place on the economics of the GIS and the applicability of classical economic theory. Some of the conclusions that have emerged from the first of these workshops include the following:[42]

- New and improved indicators are needed to identify barriers to and opportunities for service development by applying different methodologies to comparable issues and data sets.
- New indicators should supplement rather than replace existing industry data.
- International harmonization of indicators is needed.
- International co-operation is critically important in defining frameworks for competition in content across technologies that provide multiple ways of delivering the same services.
- The impact of information infrastructures and new service developments is felt across the economy in ways not yet fully understood.
- Policy and decision debate needs to address the objectives, timing of data collection and data availability required to produce quantitative and qualitative indicators for the new economy.
- The new knowledge-driven economy will continue to effect numerous changes in society, with specific impact on job security, workplace organizations, access to global markets and exposure to global competition, and will allow unprecedented access to information by all citizens.
- Data do not constitute knowledge; they need to be transformed into quantitative and qualitative information for consumption by policy makers and business leaders.

As they are developed, performance indicators should be based on both existing data and existing frameworks, modified where appropriate. These indicators should link macro-economic with micro-economic indicators and should be limited to a few key performance indicators that can be compared with those in other industries.[43]

In the Canadian experience, there are seven key areas where performance indicators are required:

- social and cultural industries
- user demand and prices
- GDP
- suppliers' market share
- employment
- R&D, investment and capital expenditures
- international trade[44]

[42] OECD, *Workshops on the Economics of Information Societies: Workshop No. 1*, June 1995.

[43] Kawachi 1996.

[44] Mozes and Sciadas 1996.

Canada began developing indicators to measure performance in 1995, and will review and develop new ones before the end of 1998. Such performance indicators will facilitate social and economic analysis, an understanding of technical change, and the development of coherence and comparability in measuring the GII-GIS of various nations.

The existing tools of socio-economic analysis allow some measurement of the information economy. If there is agreement on the industries that are primary contributors to the information economy, there are already measures of employment by industry, unemployment and consumer price indices that can be quickly applied. There are also measures of health characteristics, education and justice.

The fundamental issue, however, is that the information economy is changing the very nature of work and society. Assessing the change will require more information on the linkage between technology and employment. Human capital development requires measurements of skills acquisition and support, training and retraining programs and distance learning, and of their use by individuals.

When not engaged in tele-working or personal development, people will be able to purchase or access an enormous amount of services, goods and content on the GII, and it will become important to know their uses and the characteristics of the population using them. The results may be telling. There is already concern that the Internet may be the infrastructure of a middle-class suburb rather than the foundation of the global village.

The full economic and social potential will be realized only when the services, goods and content provided through the technology are used more extensively by the consumer, government and business sectors. For this to occur, people need access to the technologies, and policy should continue to support a diversity of content. The means to measure the impact of this complex and pervasive new area must be developed in order for policy and regulation to be effective. The following suggests some future directions for international co-operation.

4.1 Economic Analysis

As a set of economic activities, the information economy can be described by the existing SNA. However, there is need for commodity information and for price, quantity and quality measures. To some extent, the Voorburg Group — a group of experts from various statistical agencies that deal with service industries statistics — is working on this problem for all services industries. However, there is a role for the OECD and the EC in developing standard concepts and definitions, so that international comparisons can be made and economic policy for the information economy formulated.

4.2 Towards Comparability

Technical change is part of economic growth and renewal. There are already measures of R&D, patent data on invention, and innovation, such as the European Union's Community Innovation Survey (CIS). For industrial policy, it is important to know which industries are using which new services and goods and where they are located. The issues, then, are:

- to agree on a standard set of services and goods provided by industries associated with the information economy; and
- to establish a set of technologies that can be used by analysts when conducting surveys, the results of which would be internationally comparable.

These issues have been addressed over the last decade for the advanced manufacturing technologies; the same methods could be applied to the services and goods associated with the information economy.

4.3 Recommendation

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.

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 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.

References

ANGUS REID GROUP INC. *Canadian Households in the Information Age.* Ottawa, June 1995.

BALDWIN, John R., Brent Diverty and Joanne Johnson. "The Implications of Innovation and Technological Change for Employment and Human Resource Strategy." EC DG13. Luxembourg, 1995.

BAYAR, V. "Statistical Initiatives: The Perspective from the OECD. Canadian G7 Working Group on Economic Measuring Tools, The Information Economy in Canada Facts Sheets." Released on the occasion of the G7 Ministerial Meeting on the Information Society, February 25-26, 1995.

BRESNAHAN, Tim. "Telecommunications: Building the Infrastructure for Value Creation." Paper presented at the OECD Workshop on the Economics of the Information Society. Helsinki, June 1996.

BRYNJOLFSSON, Erik. "Information Technology and the Organization of the Firm: An Exploratory Firm-level Analysis." Paper presented at the OECD Workshop on the Economics of the Information Society. Helsinki, June 1996.

COURCOUBETIS, C. "Charging Principles in Multi-Service Networks." Paper presented at the OECD Workshop on the Economics of the Information Society. Istanbul, December 1995.

DICKINSON, Paul T. *Access to the Information Highway: Canadian Households in 1995.* A report prepared for Industry Canada. Ottawa, March 1996.

DICKINSON, Paul T. and George Sciadas. "Access to the Information Highway." Statistics Canada Cat. No. 63-016-XPB. Ottawa, June 1996.

EUROSTAT. Basic Indicators for Describing the Flow of Human Resources in Science and Technology (Working Paper). June 1996.

GÄRDIN, Olof. "Statistics for the Information Society and the Networked Economy." Paper presented at the OECD Workshop on the Economics of the Information Society. Istanbul, December 1995.

GAULT, F.D. "Canadian Statistics on the Information Society." Paper presented at the OECD Workshop on the Economics of the Information Society. Toronto, 1995.

__ . "Discussant's Report." Paper presented at the OECD Workshop on the Economics of the Information Society. Istanbul, December 1995.

GOVERNMENT OF CANADA. *Broadcasting Act*, S.C. 1991.

__ . *Building the Information Society: Moving Canada into the 21st Century.* Ottawa, 1996.

__ . *Telecommunications Act* (1993), Chapter 38, Canadian Telecommunications Policy.

GRUNDBERG, Lennart. "The Implementation of IT in MNCs: An Empirical Analysis Using Swedish Data." Paper presented at the OECD Workshop on the Economics of the Information Society. Helsinki, June 1996.

HANSEN, Wendy. *Developing Indicators on the Technical Capacity and Innovative Potential of the Work Force.* Ottawa: Industry Canada, 1996.

__ . "Information and Communication Technologies: Initial Results on Skill and Employment Linkages." Working paper presented at the OECD Workshop on the Economics of the Information Society. Helsinki, June 1996.

INDUSTRY CANADA. *The Telecommunications Service Industry: Trend Analysis, Canada-United States, 1980-1995.* Ottawa, January 1996.

KAWACHI, M. "Indicators for the Global Information Society." Paper presented at the OECD Workshop on the Economics of the Information Society. Tokyo, March 1996.

KESER, H. "The Front Line of ICT Statistics in Turkey." Paper presented at the OECD Workshop on the Economics of the Information Society. Istanbul, December 1995.

KIEFL, B. "Specialty Channels: Consumer Interests and Use." Paper presented at the National Symposium on New Developments in Communications Law and Policy: Canada and the Global Information Society. Ottawa, April 1996.

LEE, F. and H. Has. "A Quantitative Assessment of High-Knowledge Industries Versus Low-Knowledge Industries." OECD and French Ministry of the Economy Workshop. Paris, 1995.

MOTOHASHI, K. "Firm Level Survey of Information Networks in Japan." Paper presented at the OECD Workshop on the Economics of the Information Society. Istanbul, December 1995.

MOZES, Dora and Luis Leigh. *The Information Economy in Canada: Fact Sheets.* Industry Canada, Statistics Canada, Department of Finance and Canadian Heritage. Ottawa, 1995.

MOZES, Dora and George Sciadas. *Telecommunications, Statistical Infrastructure and Economic Analysis Program in Canada.* Ottawa, March 1996.

__. "The Demand for Telecommunications Services." *Services Indicators,* Statistics Canada Cat. No. 63-016, Vol. 1, No. 4. Ottawa, June 1995.

NIELSEN MEDIA RESEARCH. *Internet Demographic Survey: Executive Summary.* Press release, 1995.

ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD). *Canberra Manual: Manual on the Measurement of Human Resources in Science and Technology.* Paris, 1995.

__. *Technology, Productivity and Job Creation.* Directorate for Science, Technology and Industry. Paris, March 1996.

__. *Workshops on the Economics of Information Societies: Workshop No. 1.* Report on the Toronto Workshop, June 28-29, 1995, DSI/ICP(95)24. Paris, 1995.

SCIADAS, G. "Linking Information Highway Infrastructures with Transactions." Paper presented at the OECD Workshop on the Economics of the Information Society. Tokyo, March 1996.

STATISTICS CANADA. *Annual and Monthly Telephone Survey.* Cat. No. 56-203.

__. *Cable Television.* Cat. No. 56-205.

__. "Canada's International Trade Position for the Arts and Culture Sector: A Working Document Completed for the Department of Foreign Affairs and International Trade." Culture Statistics Program. March 29, 1996.

__. *Canada's International Transactions in Services,* Cat. No. 67-203,

__. *Financial Statistics for Enterprises*, Cat. No. 61-219

__. *Focus on Culture.* Cat. No. 87-004-XPB. Quarterly.

__. *Gross Domestic Product by Industry,* Cat. No. 15-001,

__. *Household Facilities Survey.* Cat. No. 64-202.

__. *Industrial Research and Development*, Cat. No. 88-202

__. *Services Indicators.* Cat. No. 63-016. Quarterly.

__. *Standard Industrial Classification, 1980.* Cat. No. 12-501. Ottawa, 1980.

__. *The Labour Force*, Cat. No. 71-001

Bibliography

BALDWIN, J. and D. Sabourin. *Survey of Innovation and Advanced Technology, 1993: Technology Adaptation in Canadian Manufacturing.* Statistics Canada Cat. No. 88-512. Ottawa, 1995.

BALDWIN, S. "New Social and Economic Approaches to a Multimedia World: Sectoral Convergence and a Clarity of Purpose." OECD Symposium on Multimedia. Tokyo, March 1996.

CANADIAN HERITAGE. *An Overview of the Film Distribution and Exhibition Industries in Canada (1988-1992).* Ottawa, October 1994.

__. *Cable Television, Industry Overview.* Ottawa, September 1994.

__. *Pay TV & Specialty Services, Industry Overview.* Ottawa, October 1994.

__. *Radio Broadcasting in Canada, Industry Overview.* Ottawa, October 1994.

__. *Television Broadcasting in Canada, Industry Overview.* Ottawa, October 1994.

__. *The Canadian Periodical Publishing Industry: An Overview.* Ottawa, February 1994.

__. *The Film and Video Industry in Canada: An Overview.* Ottawa, April 1994.

CCTA Government Centre for Information Systems, G7 Government On-Line. *Improving Access to Government Service.* Norwich, 1995.

DUCHARME, L.M. and F.D. Gault. "Surveys of Advanced Manufacturing Technology." *Science and Public Policy* 19 (1992): 393.

EUROPEAN COMMISSION (DG5). *Building the European Information Society for Us All: First Reflections of the High Level Group of Experts Interim Report.* Brussels, January 1996.

__. "Networks for People and their Communities, Making the Most of the Information Society in the European Union." *First Annual Report to the European Commission from the Information Society Forum.* Brussels, June 1996.

EUROSTAT. Council Regulation (EEC) No. 3037/90, Statistical Classification of Economic Activities in the European Community (NACE Revision 1), Official Journal of the European Communities, No L293/1. Luxembourg, October 1990.

FERNÉ, Georges and Richard Hawkins. "A New Electronic Tool for Business." *OECD Observer* 196. October/November 1995.

FOURNIER, Luc and Kim MacKinnon. *Educational Opportunities on Canada's Information Highway: The Use and Deployment of Communications and Information Technologies in Education.* Ottawa: Industry Canada, 1994.

FRANK, Jeffrey. "Preparing for the Information Highway: Information Technology in Canadian Households." *Canadian Social Trends.* Statistics Canada Cat. No. 11-008E. Ottawa, Autumn 1995.

G7. *Information Society Pilot Projects Progress Report: Released on the Occasion of the G7 Summit.* Halifax, June 15-17, 1995.

GARVIN, David A. *Managing Quality: The Strategic and Competitive Edge.* New York: The Free Press, 1988.

GAULT, F.D. "The Use of Telecommunications Services: The Need for Indicators." Contribution to the OECD Workshop on Telecommunication Performance Indicators. Paris, September 28-29, 1995.

GOVERNMENT OF CANADA. *Proposal for an Inter-Departmental Internet Client Research Project Prepared for the Internet Advisory Committee.* Ottawa, January 1996.

HARRIS, R. "World Bank Lending in IT." *The Computer Bulletin* 7 (1995): 22.

INDUSTRY CANADA. *Insight-CDROM.* Annual.

__. *Statistical Review: Information Technology and Content Industries - 1995.* Ottawa: Information Technology Industry Branch, February 1996.

__. *The Canadian Telecommunications Service Industry: An Overview Part 1: The Domestic Situation.* Ottawa, November 1994.

__. *The North American Definitions for Measuring the Information Technologies and Telecommunications Industries in the 21st Century.* Ottawa, September 1994.

INFORMATION HIGHWAY ADVISORY COUNCIL (IHAC). *Connection, Community, Content: The Challenge of the Information Highway.* Final report. Ottawa, September 1995.

INTERNATIONAL TELECOMMUNICATIONS UNION (ITU). *World Telecommunications Development Report.* Geneva, 1994.

LOVELOCK, C.H. *Services Marketing.* New York: Prentice-Hall, 1990.

MANSELL, Robin. *The New Telecommunications: A Political Economy of Network Evolution.* London: Sage Publications, 1993.

NORTHCOTT, J. and G. Vickery. "Surveys of the Diffusion of Microelectronics and Advanced Manufacturing Technology." *STI Review* 12 (1993): 7.

ORGANIZATION FOR ECONOMIC CO-OPERATION DEVELOPMENT (OECD). *Communications Outlook.* Paris, 1995.

__. *Information Infrastructures: Their Impact and Regulatory Requirements.* DSTI/TISP(95)13. Paris, January 30-31, 1996.

__. *Information Networks and New Technologies: Opportunities and Policy Implications for the 1990s.* Information Computer Communications Policy, No. 30. Paris, 1992.

__. *Information Technology Outlook.* Paris, 1994.

__. *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data.* OECD/GD(92)26. Paris, 1993.

__. *Summary Record of the Workshop on Telecommunications Performance Indicators.* Paris, September 28-29, 1995.

__. *Technology and the Economy: The Key Relationships.* Paris, 1993.

__. *Telecommunication Infrastructure: The Benefits of Competition.* Information Computer Communications Policy, No. 35. Paris, 1995.

__. *Universal Service Obligations in a Competitive Telecom Environment.* DSTI/TISP(95) Publication 38. Paris, 1995.

OWEN, John D. *The Price of Leisure.* Montreal: McGill-Queen's University Press, 1970.

PICOT, G., J. Baldwin and R. Dupuy. *Have Small Firms Created a Disproportionate Share of New Jobs in Canada? A Reassessment of the Facts.* Statistics Canada and Canadian Institute for Advanced Research. Calgary, 1994.

ROSENBERG, Nathan. *Inside the Black Box: Technology and Economics.* Cambridge: Cambridge University Press, 1982.

SCIADAS, G. "Business Services - Part 1: Evolution." *Services Indicators*, Statistics Canada Cat. No. 63-016, 2nd Quarter. Ottawa, 1994.

__. "Business Services - Part 2: The Human Side." *Services Indicators*, Statistics Canada Cat. No. 63-016. Ottawa, 1994.

SCIADAS, G. and Deborah Sussman. *Broadcasting, Telecommunications and Computer Services Industries: An Employment Profile.* Ottawa: Statistics Canada, June 1995.

STATISTICS CANADA. *A Model Survey for the Telecommunications Sector.* Proceeding of the Voorburg Group Conference. Williamsburg, Virginia, October 19-23, 1992.

__ . *Announcement: Revision of the 1980 Standard Industrial Classification.* Ottawa, January 1994.

__ . *Canada's Culture, Heritage and Identity: A Statistical Perspective 1995 Edition.* Cat. No. 87-211. Ottawa, 1995.

__ . *Printing, Publishing and Allied Industries.* Cat. No. 36-351. Annual.

__ . *Radio and Television Broadcasting.* Cat. No. 56-204. Annual.

__ . *Selected Economic, Financial and Cultural Indicators for the Cultural Industries Sector.* Education, Culture, and Tourism Division. Non-catalogued publication.

__ . "Survey of Manufacturing Technology 1989." *Indicators of Science and Technology, 1990.* Cat. No. 88-002, Vol. 1, No. 4. Ottawa, 1991.

__ . "The Interminablenet." Ottawa, February 3-9, 1995.

__ . *The Statistics Act.* 1970-71-72, C. 15, s. 1. Ottawa, 1992.

SYSTEMS OF NATIONAL ACCOUNTS. Commission of European Communities Eurostat, the International Monetary Fund, the Organization for Economic Co-operation and Development, the United Nations, and the World Bank. Brussels/Luxembourg, New York, Paris, Washington, 1993.

U.S. BUREAU OF THE CENSUS. *Manufacturing Technology 1988, Current Industrial Reports.* Washington, D.C. 1989.

U.S. COUNCIL OF ECONOMIC ADVISORS, Executive Office of the President. *Economic Benefits of the Administration's Legislative Proposals for Telecommunications.* Washington, D.C., June 1995.

U.S. DEPARTMENT OF COMMERCE. *Connecting the Nation: Classrooms, Libraries, and Health Care Organisations in the Information Age.* Washington, D.C., June 1995.

__ . *Falling through the Net: A Survey of the "Have Nots" in Rural and Urban America.* Washington, D.C., June 1995.

U.S. STATISTICAL OFFICE. *A Model Survey of Computer Services.* Series M. No. 81. New York: U.N., 1991.

__ . *International Standard Industrial Classification of All Economic Activities.* Statistical Paper Series M. No. 4, Rev. 3. New York: U.N., 1990.

Statistical Appendices

Appendix 1

Industry Classification

Table A sets out the classification structure used in this paper to define the ICT sectors. It is based on the current definitions and classifications contained in the 1980 SIC at the industry class (four digits) for each industry group.

Table A

Industries included in ICT sectors

SECTOR	SIC	DESCRIPTION
Services	481_	Telecommunication Broadcasting Industries
	4811	Radio Broadcasting Industry
	4812	Television Broadcasting Industry
	4813	Combined Radio and Television Broadcasting Industry
	4814	Cable Television Industry
	482_	Telecommunication Carriers Industry
	483_	Other Telecommunication Industries (e.g., paging)
	772_	Computer and Related Services
	7721	Computer Services
	7722	Computer Equipment Maintenance and Repair
Goods	334_	Record Player, Radio and Television Receiver Industry
	3341	Record Player, Radio and Television Receiver Industry
	335_	Communication and Other Electronic Equipment Industries
	3351	Telecommunication Equipment Industry
	3352	Electronic Parts and Components Industry
	3359	Other Communication and Electronic Equipment Industries
	336_	Office, Store and Business Machine Industries
	3361	Electronic Computing and Peripheral Equipment Industry
	3362	Electronic Office, Store and Business Machine Industry
	3368	Store and Business Machine Industry
	3369	Other Office, Store and Business Machine Industries
	391_	Scientific and Professional Equipment Industries
	3911	Indicating, Recording and Controlling Instruments Industry
	3912	Other Instruments and Related Products Industry

Appendix 2

Data

2.1 Data Sources

The ICT and the arts and culture sectors are not recognized by existing industrial classifications. As a result, aggregation of individual industries into these sectors poses problems of comparability. In the ICT goods sector, in particular, data for some component industries either are not collected or are available only at higher levels of aggregation. These aggregation problems differ by economic variable studied, depending on the data source. Footnotes to individual tables, when warranted, and the Appendices document in detail these cases. It is expected that the implementation of the NAICS will greatly facilitate the completeness of sectoral data.

The data used in this paper come from a multitude of Statistics Canada databases. Data for the ICT sectors were chosen to maximize comparability between the sectors. Most of these data, which originate in both administrative and data sources, are contained in the following publications: GDP data in Gross Domestic Product by Industry, Cat. No. 15-001, published by the Industry Measures and Analysis Division; employment data in The Labour Force, Cat. No. 71-001, published by the Household Surveys Division; financial data in Financial Statistics for Enterprises, Cat. No. 61-219, published by the Industrial Organization and Finance Division, and Services Indicators, Cat. No. 63-016; R&D data in Industrial Research and Development, Cat. No. 88-202, published by the Science and Technology Re-design Project; trade data for goods-producing industries by SIC from special tabulations by the International Trade Division and for services in Canada's International Transactions in Services, Cat. No. 67-203, published by the Balance of Payments Division.

Data for arts and culture, unless otherwise specified, come from regular surveys carried out by the Education, Culture and Tourism Division. Information can be found in the Division's standard table packages, as well as in its publication Focus on Culture, Cat. No. 87-004-XPB.

Classification frameworks are based on the Standard Industrial Classification, 1980, Cat. No. 12-501 and the NAICS, available at: http://www.statcan.ca/Documents/English/Subjects/Standards/standard.htm.

2.2 Data Qualifications

Table B lists those industries that have been omitted from the data compilations for certain variables because the data for the industries concerned are aggregated at a higher level, no data are collected for the variable in question or the data are currently under review.

Table B

The ICT industries not included in the performance indicators

Performance indicator		ICT services sector	ICT goods sector
GDP			SIC 391
FINANCIAL	Operating revenues	SIC 483	SICs 3341, 3368, 391
	Operating profits	SIC 483	SICs 3341, 3368, 391
	Assets	SIC 483	SICs 3341, 3368, 391
R&D*		**	SIC 3341
TRADE		SIC 481	

* Includes non-ICT goods sector SICs 3913 (clock and watch) and 3914 (ophthalmic goods), with scientific and professional equipment SICs 3911 and 3912. The non-ICT SICs account for a negligible amount of R&D spending.

** Broadcasting and Telecommunication services are combined, along with postal and related couriers (SIC 484), and titled as "communications" for the R&D performance indicator.

Table 1

The ICT sectors' GDP

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
			$ (millions - 1986 dollars)				%	%
ICT services sector	19,355	20,466	21,322	22,302	24,267	26,173	6.2	35.2
ICT goods sector[1]	5,267	5,523	6,109	6,378	8,454	10,761	15.4	104.3
Total ICT sectors	24,622	25,989	27,431	28,680	32,721	36,934	8.4	50.0
Total economy	503,659	494,542	497,599	510,616	531,951	542,497	1.5	7.7
ICT sectors' share of total economy	4.9%	5.3%	5.5%	5.6%	6.2%	6.8%	-	-

[1] Excludes scientific and professional equipment industries (SIC 391)

Table 2

The ICT sectors' employment[1]

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				persons			%	%
ICT services sector	267,790	268,311	244,201	257,481	277,588	317,886	3.5	18.7
ICT goods sector	103,814	93,438	94,261	91,071	85,780	95,310	-1.7	-8.2
Total ICT sectors	371,604	361,749	338,462	348,552	363,368	413,196	2.1	11.2
Total economy	13,165,087	12,916,105	12,841,973	13,014,689	13,291,612	13,505,511	0.5	2.6

[1] Includes self-employed (The Labour Force Survey)

Table 3

The ICT sectors' operating revenues

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
ICT services sector[1]	25,054	28,487	30,080	32,792	37,825	40,223	9.9	60.5
ICT goods sector[2]	10,422	10,115	10,509	11,894	14,414	16,900	10.2	62.2
Total ICT sectors	35,476	38,602	40,589	44,686	52,239	57,123	10.0	61.0
Total economy	1,229,127	1,184,042	1,183,994	1,222,217	1,361,701	1,431,768	3.1	16.5

[1] Excludes other telecom (e.g., paging) (SIC 483)

[2] Excludes record player, radio and television receiver industry (SIC 3341); electronic office, store and business machine (OSB) and other OSB industries (SIC 3368); and the scientific and professional equipment industries (SIC 391)

Table 4

The ICT sectors' operating profits

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
ICT services sector[1]	4,164	4,097	4,580	4,324	5,106	4,674	2.3	12.2
ICT goods sector[2]	497	445	416	349	793	978	14.5	96.8
Total ICT sectors	4,661	4,542	4,996	4,673	5,898	5,652	3.9	21.2
Total economy	66,500	50,705	43,610	55,440	80,064	95,176	7.4	43.1

[1] Excludes other telecom (e.g., paging) (SIC 483)

[2] Excludes record player, radio and television receiver industry (SIC 3341); electronic office, store and business machine (OSB) and other OSB industries (SIC 3368); and the scientific and professional equipment industries (SIC 391)

Table 5

The ICT sectors' assets

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
ICT services sector[1]	46,352	49,627	53,694	56,634	61,570	65,979	7.3	42.3
ICT goods sector[2]	13,655	13,827	15,321	16,712	16,136	16,726	4.1	22.5
Total ICT sectors	60,007	63,454	69,015	73,346	77,706	82,705	6.6	37.8
Total economy	1,928,229	1,970,631	2,028,536	2,103,129	2,287,940	2,411,834	4.6	25.1

[1] Excludes other telecom (e.g., paging) (SIC 483)

[2] Excludes record player, radio and television receiver industry (SIC 3341); electronic office, store and business machine (OSB) and other OSB industries (SIC 3368); and the scientific and professional equipment industries (SIC 391)

Table 6

The ICT sectors' R&D expenditures[1]

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
ICT services sector[2]	402	386	463	492	533	542	6.2	34.8
ICT goods sector[3]	1,495	1,581	1,605	1,742	1,910	1,983	5.8	32.6
Total ICT sectors	1,897	1,967	2,068	2,234	2,443	2,525	5.9	33.1
Total for all industries	5,216	5,439	5,845	6,374	6,743	6,999	6.1	34.2

[1] Data refer to intramural R&D expenditures by industries, excluding R&D by governments and educational institutions

[2] Includes postal and related courier industries

[3] Excludes record player, radio and television receiver industry (SIC 3341) ; and the scientific and professional equipment industry (SIC 391)

p... preliminary i... intended expenditures

Data compilations from: Statistics Canada - Cat. No. 88-202

Table 7

The ICT sectors' trade

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
ICT services sector								
Exports	807	1,022	1,130	1,361	1,525	n/a	17.2	89.0
Imports	1,159	1,326	1,547	1,480	1,784	n/a	11.4	53.9
Balance	-352	-304	-417	-119	-259	n/a	-	-
ICT goods sector								
Exports	9,617	10,461	11,579	12,396	16,014	19,470	15.2	102.5
Imports	18,215	19,173	21,573	24,655	30,474	35,563	14.3	95.2
Balance	-8,598	-8,712	-9,994	-12,259	-14,460	-16,093	-	-
Total ICT sectors								
Exports	10,424	11,483	12,709	13,757	17,539	n/a	13.9	68.3
Imports	19,374	20,499	23,120	26,135	32,258	n/a	13.6	66.5
Balance	-8,950	-9,016	-10,411	-12,378	-14,719	n/a	-	-

n/a: not available

Table 8

The ICT services sector's GDP

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions 1986 dollars)			%	%
Computer services	3,693	4,114	4,559	4,922	5,382	5,867	9.7	58.9
Broadcasting	1,999	2,104	2,076	2,024	2,055	2,137	1.3	6.9
Telecom carriers	13,663	14,248	14,687	15,356	16,830	18,169	5.9	33.0
Total ICT services sector	19,355	20,466	21,322	22,302	24,267	26,173	6.2	35.2
Total economy	503,659	494,542	497,599	510,616	531,951	542,497	1.5	7.7

Table 9

The ICT services sector's employment[1]

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				persons			%	%
Computer services	71,660	90,015	72,024	79,021	99,056	123,312	11.5	72.1
Broadcasting	53,973	48,675	51,960	51,550	51,003	50,023	-1.5	-7.3
Telecom carriers	142,157	129,621	120,217	126,910	127,529	144,551	0.3	1.7
Total ICT services sector	267,790	268,311	244,201	257,481	277,588	317,886	3.5	18.7
Total economy	13,165,087	12,916,105	12,841,973	13,014,689	13,291,612	13,505,511	0.5	2.6

[1] Includes self-employed (The Labour Force Survey)

Table 10

The ICT services sector's operating revenues

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Computer services	8,315	10,266	10,832	11,605	14,583	14,334	11.5	72.4
Broadcasting	4,475	4,509	4,970	5,310	6,740	8,071	12.5	80.4
Telecom carriers[1]	12,264	13,712	14,278	15,877	16,502	17,818	7.8	45.3
Total ICT services sector	25,054	28,487	30,080	32,792	37,825	40,223	9.9	60.5
Total economy	1,229,127	1,184,042	1,183,994	1,222,217	1,361,701	1,431,768	3.1	16.5

[1] Excludes other telecom (e.g., paging) (SIC 483)

Table 11

The ICT services sector's operating profits

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Computer services	752	78	408	302	771	628	-3.6	-16.6
Broadcasting	466	590	623	745	975	1,042	17.5	123.5
Telecom carriers	2,946	3,429	3,549	3,277	3,360	3,004	0.4	2.0
Total ICT services sector[1]	4,164	4,097	4,580	4,324	5,106	4,674	2.3	12.2
Total economy	66,500	50,705	43,610	55,440	80,064	95,176	7.4	43.1

[1] Excludes other telecom (e.g., paging) (SIC 483)

Sources: Statistics Canada - Cat. No. 63-016-XPB; unpublished annualised quarterly financial data for enterprises, Industrial Organization and Finance Division (IOFD), Statistics Canada;

Table 12

The ICT services sector's assets

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Computer services	6,045	6,574	6,697	6,878	6,893	7,466	4.3	23.5
Broadcasting	9,340	9,782	10,847	11,164	15,330	17,895	13.9	91.6
Telecom carriers	30,967	33,271	36,150	38,592	39,347	40,618	5.6	31.2
Total ICT services sector[1]	46,352	49,627	53,694	56,634	61,570	65,979	7.3	42.3
Total economy	1,928,229	1,970,631	2,028,536	2,103,129	2,287,940	2,411,834	4.6	25.1

[1] Excludes other telecom (e.g., paging) (SIC 483)

Table 13

The ICT services sector's R&D expenditures[1]

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Computer services	262	231	280	313	353	361	6.6	37.8
Communications[2]	140	155	183	179	180	181	5.3	29.3
Total ICT services sector	402	386	463	492	533	542	6.2	34.8
Total for all industries	5,216	5,439	5,845	6,374	6,743	6,999	6.1	34.2

[1] Data refer to intramural R&D expenditures by industries, excluding R&D by governments and educational institutions
[2] Includes broadcasting, telecom carriers, postal and related courier industries
p... preliminary i... intended expenditures

Table 14

The ICT services sector's trade[1]

		1990	1991	1992	1993	1994	1990-94 avg annual change (compounded)	1990-94 period change
				$ (millions)			%	%
Computer services	Exports	204	382	573	627	799	40.7	291.7
	Imports	518	663	926	853	1,020	18.5	96.9
	Balance	-314	-281	-353	-226	-221	-	-
Communications[2]	Exports	603	640	557	734	726	4.8	20.4
	Imports	641	663	621	627	764	4.5	19.2
	Balance	-38	-23	-64	107	-38	-	-
Total ICT services sector	Exports	807	1,022	1,130	1,361	1,525	17.2	89.0
	Imports	1,159	1,326	1,547	1,480	1,784	11.4	53.9
	Balance	-352	-304	-417	-119	-259	-	-

[1] Data refer to commodities rather than industries
[2] Excludes broadcasting

Table 15

The ICT goods sector's GDP

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions - 1986 dollars)			%	%
Record player, radio and TV receivers	159	132	147	75	95	109	-7.3	-31.5
Communication and other electronic equipment[1]	3,293	3,323	3,670	3,679	3,936	4,631	7.1	40.6
Office, store and business machines	1,815	2,068	2,292	2,624	4,423	6,021	27.1	231.7
Total ICT goods sector[2]	5,267	5,523	6,109	6,378	8,454	10,761	15.4	104.3
Total economy	503,659	494,542	497,599	510,616	531,951	542,497	1.5	7.7

[1] Further breakdown not available
[2] Excludes scientific and professional equipment industries (SIC 391)

Table 16

The ICT goods sector's employment[1]

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				persons			%	%
Record player, radio and TV receivers	6,949	5,924	5,794	4,476	3,732	2,634	-17.6	-62.1
Communication and other electronic equipment	50,314	50,601	50,984	51,625	49,422	60,392	3.7	20.0
Office, store and business machines	46,551	36,913	37,483	34,970	32,626	32,284	-7.1	-30.7
Total ICT goods sector	103,814	93,438	94,261	91,071	85,780	95,310	-1.7	-8.2
Total economy	13,165,087	12,916,105	12,841,973	13,014,689	13,291,612	13,505,511	0.5	2.6

[1] Includes self-employed (The Labour Force Survey)

Table 17

The ICT goods sector's operating revenues

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Communication and other electronic equipment	7,053	6,446	7,003	7,356	7,706	8,534	3.9	21.0
Electronic parts and components	1,495	1,515	1,371	1,721	2,448	2,853	13.8	90.8
Electronic computing and peripheral equipment	1,874	2,154	2,135	2,817	4,260	5,513	24.1	194.2
Total ICT goods sector[1]	10,422	10,115	10,509	11,894	14,414	16,900	10.2	62.2
Total economy	1,229,127	1,184,042	1,183,994	1,222,217	1,361,701	1,431,768	3.1	16.5

[1] Excludes record player, radio and television receiver industry (SIC 3341); electronic office, store and business machine (OSB) and other OSB industries (SIC 3368); and the scientific and professional equipment industries (SIC 391)

Table 18

The ICT goods sector's operating profits

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Communication and other electronic equipment	336	337	350	246	550	475	7.2	41.4
Electronic parts and components	89	59	42	77	140	105	3.4	18.0
Electronic computing and peripheral equipment	72	49	24	26	103	398	40.8	452.8
Total ICT goods sector[1]	497	445	416	349	793	978	14.5	96.8
Total economy	66,500	50,705	43,610	55,440	80,064	95,176	7.4	43.1

1 Excludes record player, radio and television receiver industry (SIC 3341); electronic office, store and business machine (OSB) and other OSB industries (SIC 3368); and the scientific and professional equipment industries (SIC 391)

Table 19

The ICT goods sector's assets

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Communication and other electronic equipment	10,726	10,841	12,492	13,941	12,546	12,288	2.8	14.6
Electronic parts and components	1,718	1,847	1,750	1,444	1,709	2,112	4.2	22.9
Electronic computing and peripheral equipment	1,211	1,139	1,079	1,327	1,881	2,326	13.9	92.1
Total ICT goods sector[1]	13,655	13,827	15,321	16,712	16,136	16,726	4.1	22.5
Total economy	1,928,229	1,970,631	2,028,536	2,103,129	2,287,940	2,411,834	4.6	25.1

[1] Excludes record player, radio and television receiver industry (SIC 3341); electronic office, store and business machine (OSB) and other OSB industries (SIC 3368); and the scientific and professional equipment industries (SIC 391)

Table 20

The ICT goods sector's R&D expenditures[1]

	1990	1991	1992	1993	1994[p]	1995[i]	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Telecommunication equipment	712	773	734	874	1,026	1,060	8.3	48.9
Other communication and electronic equipment	374	374	409	412	394	405	1.6	8.3
Electronic parts and components	43	41	49	48	54	55	5.0	27.9
Office, store and business machines	299	330	345	337	359	381	5.0	27.4
Scientific and professional equipment	67	63	68	71	77	82	4.1	22.4
Total ICT goods sector[2]	1,495	1,581	1,605	1,742	1,910	1,983	5.8	32.6
Total for all industries	5,216	5,439	5,845	6,374	6,743	6,999	6.1	34.2

[1] Data refer to intramural R&D expenditures by industries, excluding R&D by governments and educational institutions

[2] Excludes record player, radio and television receiver industry (SIC 3341)

p...Preliminary i...Intended expenditures

Table 21

The ICT goods sector's exports

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Record player, radio and TV receivers	190	114	137	145	217	257	6.2	35.3
Telecom equipment	1,102	1,073	1,436	1,924	2,329	2,839	20.8	157.6
Other communication and electronic equipment	945	879	1,000	974	1,471	1,649	11.8	74.5
Electronic parts and components	3,065	3,580	3,276	2,992	3,468	4,279	6.9	39.6
Office, store and business machines	3,160	3,554	4,129	4,612	6,328	8,068	20.6	155.3
Scientific and professional equipment	1,155	1,261	1,601	1,749	2,201	2,378	15.5	105.9
Total ICT goods sector	9,617	10,461	11,579	12,396	16,014	19,470	15.2	102.5

Table 22

ICT goods sector imports

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Record player, radio, TV	1,452	1,671	1,792	2,051	2,323	2,542	11.9	75.1
Telecom equipment	557	702	1,028	1,239	1,414	1,690	24.9	203.4
Other communication	1,497	1,388	1,389	1,623	1,862	2,163	7.6	44.5
Electronic parts and components	4,782	4,943	5,446	5,977	11,123	13,926	23.8	191.2
Office store and business machines	6,132	6,757	7,807	8,946	7,859	8,970	7.9	46.3
Scientific & professional equipment	3,795	3,712	4,111	4,819	5,893	6,272	10.6	65.3
Total ICT goods sector	18,215	19,173	21,573	24,655	30,474	35,563	14.3	95.2

Table 23

The ICT goods sector's balance of trade

	1990	1991	1992	1993	1994	1995	1990-95 avg annual change (compounded)	1990-95 period change
				$ (millions)			%	%
Record player, radio and TV receivers	-1,262	-1,557	-1,655	-1,906	-2,106	-2,285	-12.6	-81.1
Telecom equipment	545	371	408	685	915	1,149	16.1	210.8
Other communication and electronic equipment	-552	-509	-389	-649	-391	-514	1.4	6.9
Electronic parts and components	-1,717	-1,363	-2,170	-2,985	-7,655	-9,647	-41.2	-561.9
Office, store and business machines	-2,972	-3,203	-3,678	-4,334	-1,531	-902	21.2	69.7
Scientific and professional equipment	-2,640	-2,451	-2,510	-3,070	-3,692	-3,894	-8.1	-47.5
Total ICT goods sector	-8,598	-8,712	-9,994	-12,259	-14,460	-16,093	-13.4	-87.2

Table 24

The economic impact of the arts and culture sector, 1993-94

	Direct impact		Direct and indirect impact	
	Jobs persons	GDP $(millions)	Jobs persons	GDP $(millions)
Written media	77,400	4,235.9	117,050	5,893.3
Film	36,100	1,019.3	71,175	2,118.1
Broadcasting	54,700	3,511.1	80,950	5,463.2
Record production/distribution	2,750	248.7	4,400	417.8
Stage performances	70,600	544.9	96,050	833.6
Heritage	32,150	920.2	45,000	1,269.9
Libraries	34,400	1,097.7	48,200	1,514.8
Visual arts	36,500	689.5	42,350	944.6
Arts and culture education	23,800	581.2	31,200	778.8
Architecture	12,800	405.6	15,350	486.7
Design	13,600	533.0	21,000	852.8
Photography	13,900	241.4	16,100	350.0
Advertising*	76,300	1,744.6	118,300	2,791.4
Manufacturing	22,850	1,199.1	31,950	1,784.0
Wholesale	20,650	2,503.7	27,000	3,330.0
Retail	348,250	8,370.7	403,950	11,467.7
Government	22,750	1,337.0	29,900	1,787.2
Total	899,500	29,183.6	1,199,925	42,083.9
Share of total economy and total labour market (%)	6.9	4.7	9.2	6.8

* Not part of UNESCO cultural framework.

Table 25

The arts and culture sector's operating revenues (selected industries)

	1989-90	1990-91	1991-92	1992-93	1993-94	1989-90 to 1993-94 avg annual change (compounded)	1989-90 to 1993-94 period change
				$ (millions)		%	%
Broadcasting	5,685	5,933	6,281	6,603	8,207	9.6	44.4
Book publishers	1,464.2	1,521.7	1,525.9	628.8	1,699.6	3.8	16.1
Periodical publishers	885.6	866.0	838.4	852.0	795.4	-2.5	-10.2
Film and video production	583.6	700.6	688.2	697.4	996.5	14.3	70.8
Cinemas	563.4	582.4	510.8	509.8	550.7	-0.6	-2.2
Sound recording	646.7	716.1	749.6	828.2	953.8	10.2	45.5
Heritage institutions	740.3	791.1	858.9	875.8	869.3	4.1	17.4

Table 26

The arts and culture sector's operating profits (selected industries)

	1989-90	1990-91	1991-92	1992-93	1993-94	1989-90 to 1993-94 avg annual change (compounded)	1989-90 to 1993-94 period change
				$ (millions)		%	%
Broadcasting	362	545	540	786	1,102	32.1	204.4
Book publishers	89.3	94.5	55.3	73.1	83.9	-1.5	-6.0
Periodical publishers	33.9	18.3	19.3	45.9	45.2	7.5	33.3
Film and video production	15.8	7.1	76.3	60.4	86.8	53.1	449.4
Cinemas	79.5	80.9	60.2	64.2	58.9	-5.9	-25.9
Sound recording	97.3	106.0	106.6	136.6	140.1	9.5	44.0
Heritage institutions	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a: not applicable

Table 27

The value of exported cultural goods and services

	1990	1991	1992	1993	1994	1995	1990-95 period change
				$ (millions)			%
Cultural goods[1]	513.5	519.5	706.49	1,003.3	967.6	1,159.4	125.8
Cultural services[2]	1,124.2	1,216.4	1,257.1	1,455.2	1,591.0	1,833.4	63.8
Sub-total	1,637.7	1,735.9	1,963.4	2,458.5	2,558.6	2,992.8	82.7
Cultural equipment[3]	673.1	664.7	803.9	877.0	1,091.4	1,286.2	91.1
Other[4]	5,506.4	5,682.8	5,846.8	6,521.0	7,268.8	8,143.4	47.9
Total	7,817.2	8,083.5	8,614.1	9,856.5	10,918.8	12,422.4	58.9

1 Includes commodity export sales for books, printed music, newspapers, periodicals, other printed material, recordings, film and video, original works of art and other art works

2 Includes receipts for cultural service transactions (e.g., copyright licence fees location shooting, culture-related expenditures by foreign film producers, fees to Canadian artists performing abroad, merchandising of cultural goods, recreation and culture expenditures by tourists, advertising, prepublication costs, sale of subsidiary rights, and other royalties (wholesaling and printing)

3 Includes photographic, print media and audio and video equipment

4 Includes fees and expenditures for non-cultural business services (e.g., computer services, communications) and other services (e.g., touring, location shooting and tourists' non-cultural expenditure, such as transportation, food and accommodation)

Table 28

The value of imported cultural goods and services

	1990	1991	1992	1993	1994	1995	1990-95 period change
				$ (millions)			%
Cultural goods[1]	2,525.7	2,358.8	2,532.9	2,731.9	3,131.5	3,224.7	27.7
Cultural services[2]	2,337.6	2,400.8	2,566.2	2,675.3	2,918.5	2,819.1	20.6
Sub-total	4,863.3	4,759.6	5,099.1	5,407.2	6,049.9	6,043.8	24.3
Cultural equipment[3]	3,163.2	3,288.2	4,254.0	4,668.6	5,488.2	5,813.7	83.8
Other[4]	9,870.6	10,150.4	10,679.2	10,952.3	10,715.6	10,410.2	5.5
Total	17,897.1	18,198.3	20,032.2	21,028.1	22,253.8	22,267.8	24.4

1 Includes commodity export sales for books, printed music, newspapers, periodicals, other printed material, recordings, film and video, original works of art and other art works

2 Includes receipts for cultural service transactions (e.g., copyright licence fees location shooting, culture-related expenditures by foreign film producers, fees to Canadian artists performing abroad, merchandising of cultural goods, recreation and culture expenditures by tourists, advertising, prepublication costs, sale of subsidiary rights, and other royalties (wholesaling and printing)

3 Includes photographic, print media and audio and video equipment

4 Includes fees and expenditures for non-cultural business services (e.g., computer services, communications) and other services (e.g., touring, location shooting and tourists' non-cultural expenditure, such as transportation, food and accommodation)

Table 29

The balance of trade of cultural goods and services

	1990	1991	1992	1993	1994	1995	1990-95 period change
				$ (millions)			%
Cultural goods[1]	-2,012.3	-1,839.3	-1,826.5	-1,728.6	-2,163.9	-2,065.3	-2.6
Cultural services[2]	-1,213.4	-1,184.4	-1,309.1	-1,220.0	-1,327.5	-985.8	-18.8
Sub-total	-3,225.7	-3,023.7	-3,135.6	-2,948.7	-3,491.4	-3,051.1	-5.4
Cultural equipment[3]	-2,490.1	-2,623.5	-3,450.0	-3,791.6	-4,396.8	-4,527.5	-81.8
Other[4]	-4,364.1	-4,467.6	-4,832.5	-4,431.3	-3,446.9	-2,266.8	-48.1
Total	-10,079.9	-10,114.8	-11,418.1	-11,171.6	-11,335.0	-9,845.4	-2.3

1 Includes commodity export sales for books, printed music, newspapers, periodicals, other printed material, recordings, film and video, original works of art and other art works

2 Includes receipts for cultural service transactions (e.g., copyright licence fees location shooting, culture-related expenditures by foreign film producers, fees to Canadian artists performing abroad, merchandising of cultural goods, recreation and culture expenditures by tourists, advertising, prepublication costs, sale of subsidiary rights, and other royalties (wholesaling and printing)

3 Includes photographic, print media and audio and video equipment

4 Includes fees and expenditures for non-cultural business services (e.g., computer services, communications) and other services (e.g., touring, location shooting and tourists' non-cultural expenditure, such as transportation, food and accommodation)

Table 30

Household equipment penetration rates

	All households	
	1990	1995
	%	%
Telephone	98.5	98.5
Colour television	96.9	98.5
Radio	99.1	98.9
Cable	71.4	73.4
VCR	66.2	82.1
Camcorder	5.6	14.9
Tape recorder	67.5	78.8
CD player	15.5	47.4
Computer	16.2	28.8
Modem	8.4*	12.1

* 1994 data

Table 31

Penetration rates and income, 1995

	Income quartiles				
	Bottom	Second	Third	Top	All
	<$21,398	$21,398 - $39,949	$39,950 - $63,034	>$63,034	
	%	%	%	%	%
Telephone	96.0	98.8	99.5	99.7	98.5
Cable	64.4	70.3	76.7	82.2	73.4
Computer	12.3	20.2	32.5	50.2	28.8
Modem	4.8	7.3	13.6	22.4	12.0

Table 32

Use of telecommunication services by the business services sector

	Percentage of firms using the services all the time			
	All firms	By size of firm		
		Small	Medium	Large
	%	%	%	%
Long-distance voice services				
- Regular long-distance	41	41	48	38
- Discount long-distance	42	39	61	64
- 800 service	14	13	21	20
- Debit and calling cards	11	10	20	24
Radio/mobile services				
- Cellular	29	28	36	32
- Paging	10	10	12	14
- Other mobile radio	3	2	6	7
Other services				
- Facsimile	73	70	87	88
- Data transmission	19	16	29	39
- Voice mail	13	11	16	30
- Electronic text messages	7	5	16	25
- Teleconferencing	2	1	6	5
- Video conferencing	–	–	–	–
- Internet	3	2	6	5