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# THE INFORMATION AND COMMUNICATION TECHNOLOGY SECTOR IN THE SINGAPORE ECONOMY

Singapore Department of Statistics
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## I. INTRODUCTION

The rapid growth and development of the information and communication technologies (ICT) has led to their wide diffusion and application. The spectrum of economic activities derived from ICT innovations, ranging from manufacturing to services, has grown by leaps and bounds. Their economic impact across both developed and developing economies has increased rapidly in recent years. The OECD recognises that tomorrow's economy will be to a great extent an "information economy". Information and related activities will contribute greatly to the value-added of most goods and services. Federal Reserve Board Chairman Alan Greenspan believes that the healthier-than-expected US economy has been driven by ICT through dramatic improvements in computing power and communication[1].

ICT activities cut across several of the traditional economic sectors. Economists and statisticians have recognised that the evaluation of the impact of ICT necessitates the development of an appropriate statistical framework. The need for such a framework is particularly evident in Singapore given our strong orientation towards ICT-related industries. Singapore is widely known as an important hub for ICT activities, but we have seldom acknowledged this fact. Singapore already has a strong presence of ICT-linked manufacturing activities. Our wholesale trade has benefited greatly from our role as a marketing and distribution hub for ICT products. Similarly, our efficient telecommunications infrastructure has put us in a strong position to become an important hub for e-commerce.

This paper presents the preliminary attempt by the Singapore Department of Statistics to define broadly the ICT sector. The preliminary definition, ICT-Singapore, is used to provide an initial estimate of the size of the ICT sector, and its share of GDP. There are presently two other international definitions, i.e. the OECD definition and the North American Industry Classification System (NAICS). Alternative estimates using these two definitions are presented to provide a benchmark to ICT-Singapore.

[1] "Monetary Policy Testimony and Report to the Congress." Testimony of Alan Greenspan, Chairman, Federal Reserve Board. February 24, 1998.

## II. ICT-SINGAPORE

ICT-Singapore (ICT-S) adopts a very broad perspective of ICT. It encompasses the entire chain of ICT-related activities, ranging from manufacturing to the distribution (wholesale and retail) of ICT products, as well as high-tech and knowledge-based industries such as internet service providers, computer software development, publishing and computer schools. All industries which produce, process, transmit as well as facilitate the use of information and communication are included in ICT-Singapore.

The ICT sector, as defined by ICT-Singapore, is estimated to have contributed $26 billion in value-added (or 20 per cent) to Singapore's GDP in 1996. Table 1 compares the contribution of ICT-related industries in the various economic sectors to GDP in 1990 and 1996. The three main sub-sectors are manufacturing (12.3 per cent of GDP), wholesale and retail trade (3.2 per cent of GDP), and telecommunications (2.1 per cent of GDP). Computer-related services (a narrow definition of the IT industry) contributed about 0.8 per cent to GDP. This is comparable to Canada's software development and computer service industry (1.1 per cent of Canada's GDP[2]) and USA's software services (1.5 per cent of USA's GDP[3]).

Table 1 : Value-Added of ICT Activities by Sectors 1990 and 1996

| | Value-Added | | Share of GDP | | Average Annual |
|---|---|---|---|---|---|
| | 1990 | 1996 | 1990 | 1996 | Change |
| | $ million | | % | | % |
| Total | 12,473 | 26,143 | 18.4 | 20.0 | 13.1 |
| Manufacturing | 8,256 | 16,039 | 12.2 | 12.3 | 11.7 |
| Wholesale and Retail Trade | 1,709 | 4,228 | 2.5 | 3.2 | 16.3 |
| Telecommunication | 1,433 | 2,745 | 2.1 | 2.1 | 11.4 |
| Computer Related Services | 245 | 982 | 0.4 | 0.8 | 26.0 |
| Business Info & Tech Services | 590 | 1,796 | 0.9 | 1.4 | 20.4 |
| Other Services | 240 | 353 | 0.4 | 0.3 | 6.6 |

[2] Statistics Canada, "The Software Development and Computer Services Industry : An Overview of the Developments in the 1990s", Services Indicators, 4th Quarter 1997.
[3] U.S Department of Commerce, The Emerging Digital Economy, April 1998.

Compared to 1990, the size of the ICT sector has more than doubled from $12 billion to $26 billion, with an average annual increase of 13.1 per cent in nominal terms. The sector's share of GDP increased by 1.6 percentage points as a result of increased share in wholesale and retail trade, computer-related services as well as business information and technical services.

## III. INDUSTRIES IN ICT-SINGAPORE

### A. Manufacturing

Manufacturing industries account for more than 60 per cent of the ICT sector, reflecting the concentration of high-tech industries within the manufacturing sector. The manufacturing of computers and electronic office equipment and the manufacturing of electronic components contributed the highest value-added of $8 billion and $5 billion respectively (Table 2).

Table 2 : Value-Added of ICT Manufacturing Industries 1996

| | $ million | as a % of GDP | as a % of ICT-S |
|---|---|---|---|
| Manufacturing | 16,039 | 12.3 | 61.4 |
| Publishing & reproduction of recorded media | 860 | 0.7 | 3.3 |
| Insulated wires & cables | 510 | 0.4 | 2.0 |
| Electronic components | 4,910 | 3.8 | 18.8 |
| Communication eqmt | 679 | 0.5 | 2.6 |
| TV, radios, audio & video recorders | 916 | 0.7 | 3.5 |
| Computers & electronic office eqmt | 7,909 | 6.0 | 30.3 |
| Other electronic eqmt | 22 | - | 0.1 |
| Instruments for measuring & testing; industrial process eqmt | 233 | 0.2 | 0.9 |

### B. Wholesale and Retail Trade

Wholesale and retail trade account for another 16 per cent of the ICT sector. Singapore is an important marketing and distribution hub for ICT products, including those produced by large manufacturing firms based in Singapore. Mirroring the importance of high-tech manufacturing industries, the wholesalers that contribute most to the ICT sector are those trading in telecommunication and office machinery and equipment.

Retail trade, which reflects the domestic demand for ICT products, contributes less than 1 per cent to the ICT sector.

Table 3 : Value-Added of ICT Wholesale and Retail Trade 1996

| | $ million | as a % of GDP | as a % of ICT-S |
|---|---|---|---|
| Wholesale and Retail Trade | 4,228 | 3.2 | 16.2 |
| Wholesale | 4,082 | 3.1 | 15.6 |
| Telecom & office machinery & equipment | 1,653 | 1.3 | 6.3 |
| TVs & radios | 897 | 0.7 | 3.4 |
| Electronic components & wiring | 1,471 | 1.1 | 5.6 |
| CDs, LDs, cassette tapes & musical instruments | 60 | - | 0.2 |
| Retail | 146 | 0.1 | 0.6 |
| Telecom & office machinery & equipment | 68 | 0.1 | 0.3 |
| TVs & radios | 55 | - | 0.2 |
| CDs, LDs, cassette tapes & musical instruments | 23 | - | 0.1 |

## C. Telecommunications

The telecommunications sector contributes 10.5 per cent to the ICT sector. The number of establishments in this sector has increased from 3 in 1990 to 39 in 1996. The sector has also expanded to include new and emerging activities such as internet service providers, mobile cellular and paging services as well as satellite up-link and down-link services. Although these activities are presently very small, they are expected to grow with further market liberalisation.

Table 4 : Value-Added of Telecommunication Industries 1996

| | $ million | as a % of GDP | as a % of ICT-S |
|---|---|---|---|
| Telecommunications | 2,745 | 2.1 | 10.5 |
| Telecom services (incl mobile & paging services) | 2,701 | 2.1 | 10.3 |
| Data communications (incl Internet Service Providers) | 6 | - | - |
| Supporting services to telecom | 29 | - | 0.1 |
| Others | 9 | - | - |

## D. Computer-Related Services

Computer-related services contribute 3.8 per cent to the ICT sector with the software development and consultancy industry contributing the major share (Table 5). The industry's current size is relatively small but its share to GDP is comparable to that of other industrialised OECD countries (Table 6). With a growth of 11 per cent in 1996 and an estimated growth of 26 per cent in 1997, it is one of the fastest growing industries in Singapore.

Table 5 : Value-Added of Computer Related Services 1996

| | $ million | as a % of GDP | as a % of ICT-S |
|---|---|---|---|
| Computer-Related Services | 982 | 0.8 | 3.8 |
| Hardware maintenance | 30 | - | 0.1 |
| Software development & consultancy | 578 | 0.4 | 2.2 |
| Data processing & database | 185 | 0.1 | 0.7 |
| Others | 188 | 0.1 | 0.7 |

Table 6 : Comparison of Value-Added of Computer-Related Services as a % of GDP

| Country[1] (Year) | As a % of country's GDP |
|---|---|
| Singapore (1996) | 0.8 |
| United States[2] (1996) | 1.5 |
| Canada[3] (1996) | 1.1 |
| Japan (1995) | 1.3 |
| Australia (1993) | 1.1 |
| New Zealand (1995) | 1.0 |
| France (1995) | 0.9 |
| Netherlands (1992) | 0.7 |
| Finland (1995) | 0.8 |

[1] Unless otherwise stated, data for OECD countries are obtained from "The Software Sector : A Statistical Profile for Selected OECD Countries", OECD 1998

[2] US Department of Commerce, "The Emerging Digital Economy, April 1998.

[3] Statistics Canada, , "The Software Development and Computer Services Industry : An Overview of the Developments in the 1990s", Services Indicators, 4th Quarter 1997.

Reflecting the growth potential of computer-related services, the number of IT professionals more than doubled from 8,508 in 1990 to 21,578 in 1995. This is equivalent to an average compound growth rate of 20 per cent. The National Computer Board's (NCB) latest IT Manpower & Skills Inventory Survey 1997[4] estimated the number of IT professionals to increase from about 31,000 in 1997 to 42,000 by the year 2000.

### E. Business Information and Technical Services

Business information and technical services constitutes 6.9 per cent of the ICT sector. The largest industry in this sub-sector is business and management consultancy services, reflecting the growing importance of information and technical services to the corporate world.

Table 7 : Value-Added of ICT Business Information and Technical Services

| | $ million | as a % of GDP | as a % of ICT-S |
|---|---|---|---|
| Business Information & Technical Services | 1,796 | 1.4 | 6.9 |
| R&D on natural science & engineering | 37 | - | 0.1 |
| Market research | 64 | - | 0.2 |
| Business & mgmt consultancy services | 829 | 0.6 | 3.2 |
| Consultant engineering services | 418 | 0.3 | 1.6 |
| Advertising | 374 | 0.3 | 1.4 |
| News agency activities | 74 | 0.1 | 0.3 |

## IV. OTHER INTERNATIONAL STANDARDS

Two alternative international definitions of the ICT sector have been proposed: ICT-OECD and the information sector in the NAICS (IS-NAICS).

### A. ICT-OECD

ICT-OECD is the definition of the ICT sector adopted by the OECD Information, Computers and Communications Panel (ICCP) in June 1998. In arriving at this definition, the Panel decides to include only those industries

[4] National Computer Board, IT Manpower and Skills Inventory Survey 1997.

which facilitate the processing, transmission and display of information by electronic means[5] (Appendix 2).

The emphasis of ICT-OECD is on the technology facilitating the processing and transfer of information rather than the information *per se* or the development of content. Hence, ICT-OECD includes the manufacturing of computers and telecommunications equipment but excludes activities such as publishing, reproduction of recorded media, broadcasting, library and archives (which are included in ICT-Singapore).

## B. IS-NAICS

The North American Industry Classification System (NAICS) is a collaborative effort of Canada, USA and Mexico (Appendix 3). NAICS will be implemented for US statistical data with reference year beginning on or after 1 January 1997. An important feature of the NAICS is its creation of an information sector which is distinct from the traditional manufacturing and services sectors. IS-NAICS includes services, which have been provided in digitised forms, such as publishing, motion picture and sound recording, broadcasting, telecommunications and information services (e.g. news syndicate and libraries).

IS-NAICS comprises industries primarily producing, processing and distributing information[6]. The information cluster, as defined under IS-NAICS, groups three types of establishments:

(a) those engaged in producing, processing and distributing information and cultural products;

(b) those that provide the means to transmit or distribute these products as well as data or communications; and

(c) those that process data or transactions.

## C. Comparison

Using different definitions, the estimated share of the ICT sector in Singapore's GDP ranged from 3.7 per cent (NAICS) to 20 per cent (ICT-Singapore) (Table 7). Using a definition very similar to ICT-OECD, the ICT sector in US has been estimated by the US Department of Commerce to contribute about 7.5 per cent to US GDP[7]. In comparison, the share of the ICT

[5] "The OECD's Statistical Panel : Results and Work Agenda", presented at 13th Voorburg Group Meeting on Service Statistics.
[6] North American Industry Classification System, Part VIII, "Proposed New Industry Classification for Information".
[7] U.S Department of Commerce, The Emerging Digital Economy, April 1998.

share in Singapore's GDP under ICT-OECD is estimated to be about 17 per cent, which shows the very substantial dependence of the Singapore economy on ICT.

Table 8 : Singapore ICT Sector by Different Definitions 1996

| | ICT-S Definition | OECD Definition | NAICS Definition | ICT-S Definition | OECD Definition | NAICS Definition |
|---|---|---|---|---|---|---|
| | $ million | | | as a % of GDP | | |
| Total | 26,143 | 22,076 | 4,896 | 20.0 | 16.9 | 3.7 |
| Manufacturing | 16,039 | 15,179 | 818 | 12.3 | 11.6 | 0.6 |
| Wholesale and Retail Trade | 4,228 | 3,192 | 0 | 3.2 | 2.4 | 0.0 |
| Telecommunication | 2,745 | 2,737 | 2,745 | 2.1 | 2.1 | 2.1 |
| Computer Related Services | 982 | 968 | 938 | 0.8 | 0.7 | 0.7 |
| Business Info & Tech Services | 1,796 | 0 | 74 | 1.4 | 0.0 | 0.1 |
| Other Services | 353 | 0 | 321 | 0.3 | 0.0 | 0.2 |

The emphasis of ICT-OECD is on the technology facilitating the processing and transfer of information rather than the information *per se*. NAICS, on the other hand, emphasises the development of information content and its transmission. ICT-Singapore encompasses both these definitions, and includes the wholesale and retail of all ICT products, computer schools, business information and technical services. Table A1 in the Appendix shows the detailed activities included in each of these three definitions.

## V. CONCLUSION

Our preliminary definition of the ICT sector, ICT-Singapore, has provided us with the basis to develop statistical indicators to monitor and track its growth and performance. The addition in the 1996 revision of the Singapore Standard Industrial Classification (SSIC) of new industrial codes which identify separately several of the new and emerging activities has enabled us to derive reasonable estimates of their size and contribution to the Singapore economy. DOS will continue to refine ICT-Singapore, and in collaboration with other government agencies, monitor closely the emergence of new economic activities to ensure that they are separately identified in the next revision of the SSIC.

ICT is integral to the Singapore economy. Cutting across several traditional economic sectors, the ICT sector is estimated to contribute to about 20 per cent of Singapore's GDP, reflecting its significance. With our emphasis

on high-tech industries and knowledge-based services, the ICT sector is proportionately larger in Singapore than in most other economies. The estimated 17 per cent share of the ICT sector in Singapore's GDP, as defined by ICT-OECD, is more than twice the estimated 7.5 per cent share of the sector in US's GDP. The synergy we obtain by being a hub for ICT will provide added momentum for future growth.

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# APPENDICES

**Table A1: Comparison of Classifications of Information and Communications Technology Sector**

| | DOS | OECD | NAICS |
|---|---|---|---|
| **Manufacturing** | | | |
| 2210 Publishing | ✓ | x | ✓ |
| 2230 Reproduction of recorded media | ✓ | x | x |
| 3030 Mfg of insulated wires and cables | ✓ | ✓ | x |
| 3111 Mfg of semiconductor devices | ✓ | ✓ | x |
| 3119 Mfg of electronic valves and tubes | ✓ | ✓ | x |
| 3120 Mfg of communication equipment | ✓ | ✓ | x |
| 3130 Mfg of TV & radios, audio & video recorders | ✓ | ✓ | x |
| 3141 Mfg of computers and peripheral equipment | ✓ | ✓ | x |
| 3149 Mfg of other electronic equipment | ✓ | ✓ | x |
| 3212 Mfg of instruments for measuring, checking & testing | ✓ | ✓ | x |
| 3213 Mfg of industrial process equipment | ✓ | ✓ | x |
| **Wholesale and Retail Trade** | | | |
| 50521 Wholesale of pagers, handphones & telecom apparatus | ✓ | ✓ | x |
| 50522 Wholesale of office machines & eqmt (incl accessories) | ✓ | ✓ | x |
| 50523 Wholesale of computer hardware & peripheral equipment | ✓ | ✓ | x |
| 50524 Wholesale of computer software | ✓ | ✓ | x |
| 50525 Wholesale of computer accessories | ✓ | ✓ | x |
| 50336 Wholesale of radio, TV etc | ✓ | x | x |
| 50342 Wholesale of CDs, LDs, cassette tapes, musical instruments | ✓ | x | x |
| 50515 Wholesale of telecom eqmt | ✓ | ✓ | x |
| 50516 Wholesale of electrical & electronic components, wiring | ✓ | ✓ | x |
| 51436 Retail of radio, TV etc | ✓ | x | x |
| 51452 Retail of CDs, LDs, cassette tapes, musical instruments | ✓ | x | x |
| 51471 Retail of pagers, handphones & telcom apparatus | ✓ | ✓ | x |
| 51472 Retail of calculators, typewriters & other office equipment | ✓ | ✓ | x |
| 51473 Retail of computer software, hardware & accessories | ✓ | ✓ | x |
| 51474 Retail of computer & office eqmt consumables | ✓ | ✓ | x |
| **Telecommunications** | | | |
| 6421 Telecom services (incl paging services) | ✓ | ✓ | ✓ |
| 6422 Data communicatios (incl network services) | ✓ | ✓ | ✓ |
| 6423 Broadcasting services | ✓ | x | ✓ |
| 6424 Supporting services to telecom | ✓ | ✓ | ✓ |
| 6429 Telecommunications nec | ✓ | ✓ | ✓ |
| **Computer-Related Services** | | | |
| 7122 Renting of office machinery incl computers | ✓ | ✓ | x |
| 7210 Hardware consultancy | ✓ | ✓ | x |
| 72201 Development of software & multimedia works | ✓ | ✓ | ✓ |
| 72202 Publishing of software & multimedia works | ✓ | ✓ | ✓ |
| 72203 Software consultancy services | ✓ | ✓ | ✓ |
| 7230 Data processing | ✓ | ✓ | ✓ |
| 7240 Database activities | ✓ | ✓ | ✓ |
| 72501 Maintenance & repair computer hardware etc | ✓ | ✓ | x |
| 72502 Maintenance & repair office machinery & eqmt | ✓ | ✓ | x |
| 7290 Other computer related activities | ✓ | ✓ | ✓ |
| 74911 IT manpower contracting services | ✓ | x | x |

| | DOS | OECD | NAICS |
|---|---|---|---|
| **Business Information & Technical Services** | | | |
| 7310 R&D on natural science & engineering | ✓ | x | x |
| 7413 Market research | ✓ | x | x |
| 74141 Business & mgmt consultancy services | ✓ | x | x |
| 74211 Consultant engineering services | ✓ | x | x |
| 7430 Advertising | ✓ | x | x |
| 74991 News agency activities | ✓ | x | ✓ |
| **Other Services** | | | |
| 9211 Motion picture & video production and distribution | ✓ | x | ✓ |
| 9212 Motion picture projection | ✓ | x | ✓ |
| 9213 Radio & TV activities | ✓ | x | ✓ |
| 9221 Library & archives activities | ✓ | x | ✓ |
| 80203 IT education & training institutions | ✓ | x | x |

## DEFINITION FOR THE ICT SECTOR - by OECD[8]

The attached list of industries was approved by delegates attending the Second *Ad Hoc* Meeting of Indicators for the Information Society in June 1998 under the aegis of the Information, Computers and Communications Panel (ICCP) Statistical Panel and is submitted to the ICCP Committee for declassification. The definition is a compromise, limited to those industries which facilitate, by electronic means, the processing, transmission and display of information. It excludes the industries which create the information, the so-called 'content' industries. The definition permits the immediate gathering of statistics for international comparison in an area of considerable policy importance because of deregulation and technological change. The statistics and their comparison will contribute to the work of the next stage of the Panel which is the development of a similar list of content industries and a classification of products which belong to the information and communication technology (ICT) sector.

On the basis of this decision, it was further decided that the definition being proposed would not include any "parts" of industries but would rather include the entire industry even though in some cases the latter might not be strictly an ICT activity. Exceptions to this general rule, could be considered whenever it was felt, by the majority of countries, that the complete exclusion of an industry would mean the exclusion of a significant number of businesses which are producing ICT goods and services.

A set of principles was adopted that would provide a conceptual basis to the selection of industries chosen as "ICT".

For manufacturing industries, the products of a candidate industry must:

- be intended to fulfil the function of information processing and communication, including transmission and display; or
- use electronic processing to detect, measure and/or record physical phenomena, or to control a physical process.

Components primarily intended for use in such products are also included.

For service industries, the products of a candidate industry must:

- be intended to enable the function of information processing and communication by electronic means.

[8] Extracted from "The OECD's Statistical Panel : Results and Work Agenda", with explanatory footnotes added.

In the view of the members of the Panel, the 'information economy' consists of the economic activities of those industries that produce content, and of the ICT industries that move and display the content. These economic activities include the use of information and of ICT products by both people and business. The 'information society' includes the social impact of the information economy. These "working definitions" were seen as means to promote discussion of the definitions of the constituent parts and of their boundaries. They could not be seen as final until agreement had been reached on the parts.

The next steps in building indicators for the information society is agreement on a definition of the content industries which, when added to the ICT definition, will provide a working definition of the information economy. At the same time, the Panel will develop a classification of ICT products which will permit the gathering of statistics on the ICT output of industries not included in the definition.

The proposed definition of ICT includes the following International Standard Industry Classifications (ISIC Rev.3) industries:

**Manufacturing**

3000 Manufacture of office, accounting and computing machinery

3130 Manufacture of insulated wire and cable

3210 Manufacture of electronic valves and tubes and other electronic components

3220 Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy

3230 Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods

3312 Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process control equipment

3313 Manufacture of industrial process control equipment

**Services -- goods related**

5150 Wholesale of machinery, equipment and supplies[9]

7123 Renting of office machinery and equipment (including computers)

**Services -- intangible**

6420 Telecommunications[10]

7200 Computer and related activities

ISIC 3130 (manufacture of insulated wire and cable) raised some questions due to its inclusion of transmission cable for electric power. Because of the perceived growing importance of optic fibre cables as part of this broader industry, it was agreed to include this industry with the understanding that there would have to be a footnote on historical time series alerting users that because of technological change and the advent of optic fibres the nature of this industry had changed significantly over time.

After some deliberation, the Panel excluded the Reproduction of Recorded Media industry (ISIC 2230) as it was felt to belong to the content industries in ISIC Division 22, Publishing, Printing and Reproduction of Recorded Media. Retail sale of household appliances, articles and equipment (ISIC 5233) was excluded because the classification was felt to be inaccurate for the purpose intended.

The discussion then focused on the possible inclusion of wholesale, retail and rental activities in the industry definition of ICT. In the case of wholesale (5150, Wholesale of machinery, equipment and supplies) for many OECD Member countries where ICT manufacturers do not produce, they are classified as wholesalers. Thus many countries expressed a desire to include this industry. The problem is that ISIC revision 3 does not have sufficient subcategories to allow a differentiation between ICT equipment wholesaling and the wholesaling of other equipment (e.g. industrial machinery). To avoid this problem, delegates agreed to the use of their more detailed national classifications[11].

[9] Where available, countries should only include those subsectors of this industry that directly provide ICT wholesaling services. This will avoid the inclusion of extraneous wholesaling activity. For example, using the NACE nomenclature, only NACE categories 5143, 5164 and 5165 should be included.

[10] In those instances where countries include telecommunication activities as part of radio and television activities (ISIC 9213), radio and television activities (9213) should be included in this definition. Otherwise, it should not be included.

[11] The SSIC 1996 provides sufficient subcategories for the wholesale trade of ICT commodities to be separately identified.

With little discussion, delegates agreed to include 7123 (Renting of office machinery and equipment (including computers)). Because very few retailers exclusively sell ICT products[12], it was agreed to postpone the inclusion of 5233 (other retail trade of new goods in speciality stores) until a commodity definition was available.

[12] This is not so in Singapore. Although the line between wholesaling and retailing may become less clear, there is a sizeable number of establishments engaging in the retailing of ICT products. The SSIC 1996 provides sufficient subcategories for the retail trade of ICT commodities to be separately identified. The US in defining the ICT sector has included the retail trade of ICT commodities for completeness

## DEFINITION FOR THE INFORMATION SECTOR OF THE NAICS[13]

Representatives of the statistical agencies of Canada, Mexico, and the United States agree to a draft industry classification for the information sector. The draft classification includes four sub-sectors, Publishing; Motion Picture and Sound Recording; Broadcasting and Telecommunications; and Information Services and Data and Transaction Processing Services. These are further subdivided into 9 industry groups and 29 industries.

For the purpose of developing NAICS, it is the transformation of information into a commodity that is produced, manipulated and distributed by a number of growing industries that is at issue. The proposed Information sector groups three types of establishments: those engaged in producing, manipulating and distributing information and cultural products; those that provide the means to transmit or distribute these products as well as data or communications; and those that process data or transactions. (Cultural products are those that directly express attitudes, opinions, ideas, values, and artistic creativity; provide entertainment; or offer information and analysis concerning the past and present. Included in this definition are popular, mass-produced, products as well as cultural products that normally have a more limited audience, such as poetry books, literary magazines or classical records.) These activities are currently classified throughout the existing national classifications; traditional publishing is in manufacturing, broadcasting in communications, software production in business services, film production in amusement services, etc. The unique characteristics of information and cultural products, and of the processes involved in their production and distribution, justify the creation of an Information sector, distinct from the goods-producing and service-producing sectors. Some of these characteristics are:

1. Unlike traditional goods, an “information or cultural product” such as a newspaper or television program does not necessarily have tangible qualities, nor is it necessarily associated with a particular form. A movie can be shown at a movie theater, on a television broadcast, through video on demand or rented at a local video store. A sound recording can be aired on radio, embedded in multi-media products or sold at a record store.

2. Unlike traditional services, the delivery of these products does not require direct contact between the supplier and the consumer.

3. The value of these products to the consumer does not lie in their tangible qualities but in their information, educational, cultural or entertainment content.

[13] Extracted from North American Industry Classification System, Part VIII, Agreement Number 18, “Proposed New Industry Classification for Information”.

4. Unlike goods or services, information and cultural products can be copied easily. The law has long recognized this; copyright law protects the intangible property of intellectual creations such as books and sound recordings. Copyright applies to all original literary, dramatic, musical, and artistic works, including databases and computer programs.

5. The intangible property aspect of information and cultural products makes the processes involved in their production and distribution very different from goods and services. Only those possessing the rights to these works are authorized to reproduce, alter, improve and distribute them. Acquiring and using these rights often involves significant costs. In addition, technology is revolutionizing the distribution of these products. It is possible to distribute them in a physical form, via broadcast or on line.

6. Distributors of information and cultural products can easily add value to the products they distribute. For instance, broadcasters add advertising not contained in the original product. This capacity means that unlike traditional distributors, they derive revenue not from sale of the distributed product to the final consumer, but from those who pay for the privilege of adding information to the original product. Similarly, a CD-ROM publisher can acquire the rights to thousands of previously published newspaper and periodical articles and add new value by providing search and software and organizing the information in a way that facilitates research and retrieval. These products often command a much higher price than the original information.

The distribution modes for information commodities may either eliminate the necessity for traditional manufacture, or reverse the conventional order of manufacture-distribute: A newspaper distributed on line, for example, can be printed locally or by the final consumer. Similarly, it is anticipated that packaged software, which today is mainly bought through the traditional retail channels, will soon be available mainly on line. The NAICS Information sector is designed to make such economic changes transparent as they occur, or to facilitate designing surveys that will monitor the new phenomena and provide data to analyze the changes. Other classification systems tend to obscure economic changes of this kind.

Many of the industries in the NAICS information sector are engaged in producing and manipulating products protected by copyright law, or in distributing them (other than distribution by traditional wholesale and retail methods). Examples are traditional publishing industries, software and database publishing industries and film and sound industries. Broadcasting and telecommunication industries, and information providers and processors, are

also included in the information sector, because their technologies are so closely linked to other industries in the information sector.

Although many new industries have been created for this sector, most of the activities it contains have existed for some time and are distributed throughout the existing classifications. The following paragraphs provide a brief description of the individual components of this sector.

The Publishing sub-sector groups establishments 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 or 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.

In most other classification systems, publishing is treated as a subsidiary activity to a manufacturing activity--book and newspaper publishing, for example, are depicted as subsidiary activities to printing, and placed with printing in the classification. In NAICS, publishing—the reporting, writing, editing, and other processes that are required to create an edition of a newspaper, for example--is treated as a major economic activity in its own right, and classified in the Information sector, whereas printing remains in the NAICS Manufacturing sector. In part, the NAICS classification reflects the fact that publishing increasingly takes place in establishments that are physically separate from the associated printing establishments. More crucially, the NAICS classification of book and newspaper publishing is intended to portray their roles in a modern economy, in which they do not resemble manufacturing activities.

Software publishing is included here because the activity--creation of a copyrighted product and bringing it to market--is equivalent to the creation process for other types of intellectual products. Reproduction of pre-packaged software is treated in NAICS as a manufacturing activity; on-line distribution of software products is in the Information sector, and custom design of software to client specifications remains in business services. These distinctions arise because of the different ways that software is created, reproduced, and distributed.

The Motion Picture and Sound Recording sub-sector groups establishments involved in the production and distribution of motion pictures and sound recordings (those involved exclusively in the wholesaling of sound recordings are classified in Wholesale Trade). While motion picture and sound recordings are also “published,” the processes involved are sufficiently different from those traditional publishing industries to warrant placing them in

the Motion Picture and Sound Recording sub-sector. The production and distribution of these products involves a complex process and several distinct industries.

The Motion Picture and Video Industries industry group includes separate industries for Motion Picture and Video Production, Motion Picture and Video Distribution, Teleproduction and Other Post-Production Services, Motion Picture and Video Exhibition, and Other Motion Picture and Video Industries. The distribution industry includes establishments primarily engaged in acquiring the distribution rights (major input) for films and programs, and charging such clients as movie theaters and broadcasters to show them; those engaged in wholesaling videos to retail stores and rental outlets are classified in Wholesale Trade.

The Sound Recording Industries industry group contains new classes for Record Production Companies, Integrated Record Companies, Music Publishing, Sound Recording Studios, and Other Sound Recording Industries. Record production companies are primarily engaged in searching out, identifying and contracting artists for which they arrange and finance the production of master tapes for which they hold the reproduction rights. Establishments in this industry do not own duplication facilities or have distribution capabilities, so they commercialize these rights through leasing/licensing agreements with third parties. Integrated record production companies (major record labels) integrate the production, manufacturing and/or distribution functions, commercializing reproduction rights through these vertically integrated operations. While establishments engaged in record production derive most of their revenues from leasing/licensing the reproduction rights of master recordings and from mechanical royalties, integrated record companies derive most of their revenues from the exploitation of their rights to distribute duplicate sound recordings. The industrial structure proposed for this area is a major revision of existing classifications; the purpose of this restructuring is to reflect the actual activity structure of the sound recording industry, which is not well articulated in current classifications.

The structure of the Broadcasting and Telecommunications sub-sector was decided upon in a previously signed preliminary agreement (Number 2), but at the time, the sector in which it would be included had not been determined. The three countries have agreed to place it in the Information sector. The following is a summary of the previously signed agreement.

The Broadcasting and Telecommunications sub-sector includes establishments providing point-to-point communications and the services related to that activity. The industry groups (Radio and Television Broadcasting, Cable Networks and Program Distribution, and Telecommunications) are based on differences in the methods of

communication and in the nature of services provided. The Radio and Television Broadcasting industry group includes establishments that operate broadcasting studios and facilities for over the air or satellite delivery of radio and television programs of entertainment, news, talk, and the like. These establishments are often engaged in the production and purchase of programs and generating revenues from the sale of air time to advertisers, and from donations, subsidies, and/or the sale of programs. The Cable Network and Program Distribution industry group includes two types of establishments. Cable Networks establishments operate studios and facilities for the broadcasting of programs that are typically narrow cast in nature (limited format such as news, sports, education, and youth-oriented programming). The services of these establishments are typically sold on a subscription or fee basis. Delivery of the programs to customers is handled by other establishments, in the Cable and Program Distribution industry, that operate cable systems, direct-to-home satellite systems, or other similar systems. The Telecommunications industry group is primarily engaged in operating, maintaining, and/or providing access to facilities for the transmission of voice, data, text, sound, and full motion picture video between network termination points. A transmission facility may be based on a single technology or a combination of technologies.

The Information Services and Data and Transaction Processing sub-sector is subdivided into two industry groups. The Information Services industry group includes establishments that provide, store, or provide access to information. The Data and Transaction Processing industry group includes establishments that process data and transactions.

## STRUCTURE OF THE INFORMATION SECTION IN THE NAICS

XX Publishing
XXX Newspaper, Periodical, Book, and Data Base Publishing
XXXX Newspaper Publishing
XXXX Periodical Publishing
XXXX Book Publishing
XXXX Database Publishing
XXXX Other Publishing
XXX Software Publishing
XXXX Software Publishing
XX Motion Picture and Sound Recording
XXX Motion Picture and Video Industries
XXXX Motion Picture and Video Production
XXXX Motion Picture and Video Distribution
XXXX Teleproduction and Other Post-Production Services
XXXX Motion Picture and Video Exhibition
XXXX Other Motion Picture and Video Industries
XXX Sound Recording Industries
XXXX Record Production Companies
XXXX Integrated Record Companies
XXXX Music Publishing
XXXX Sound Recording Studios
XXXX Other Sound Recording Industries
XX Broadcasting and Telecommunications
XXX Radio and Television Broadcasting
XXXX Radio Broadcasting
XXXX Television Broadcasting
XXX Cable Networks and Program Distribution
XXXX Cable Networks
XXXX Cable and Program Distribution
XXX Telecommunications
XXXX Wired Telecommunications Carriers
XXXX Wireless Telecommunications Carriers, Except Satellite
XXXX Telecommunications Resellers
XXXX Satellite Telecommunications
XXXX Other Telecommunications
XX Information Services and Data and Transaction Processing
XXX Information Services
XXXX News Syndicates
XXXX Libraries and Archives
XXXX Other Information Services
XXX Data and Transaction Processing
XXXX Data and Transaction Processing