



INTERNATIONAL TELECOMMUNICATION UNION
Telecommunication Development Bureau
Telecommunication Statistics and Data Unit

29 November 2002
Original: English

3rd World Telecommunication/ICT Indicators Meeting
Geneva, 15 - 17 January 2003

Document: WICT-09E

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Title: Latest Developments in ICT Statistics
Singapore

**WORLD TELECOMMUNICATION/ICT INDICATORS
MEETING**

15-17 JANUARY 2003, GENEVA, SWITZERLAND

**Latest Developments in ICT Statistics
SINGAPORE**

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SINGAPORE

Over the past few years, we have witnessed the rapid growth and development of information and communication technologies (ICT). Their wide diffusion and application, coupled with the liberalization of the telecommunications industry and availability of ICT infrastructure, has transformed the way companies operate and the way we work and play.

To scan the rapidly changing world of ICT landscape as well as to track the effectiveness of the various government's ICT programmes and initiatives, an array of statistics have been developed and collected. The Singapore Department of Statistics (DOS) and the Infocomm Development Authority of Singapore (IDA)¹ are the two main government agencies responsible for the compilation of ICT-related statistics in Singapore. IDA is charged with leading Singapore's drive to become a global info-communications centre and worldwide digital hub. It also plays a catalytic role to nurture a healthy market for the information and communication technology (ICT) industry in Singapore.

As Singapore adopts a decentralized statistical system, official statistics are collected and compiled by DOS (the national statistical body) as well as by other gazetted research and statistical units (RSUs), government departments and statutory boards. DOS, being the national statistical authority for official statistics on the Singapore economy and population, compiles and publishes ICT-related data from existing nation-wide and economy-wide business and household surveys. IDA, the government agency overseeing the ICT sector, carries out focused activities relating to ICT. The Research and Statistics Unit (RSU), a gazetted unit within IDA, collects statistics on the information and communications technology (ICT) industry in Singapore. These statistics are used to facilitate the tracking of the development and growth of the ICT-enabled activities in key economic sectors and the info-society in Singapore. While some of the data are collected through surveys, others are obtained through IDA's administrative and operational functions.

¹ IDA was formed on 1 December 1999 from the merger between the National Computer Board (NCB) and the Telecommunications Authority of Singapore (TAS).

The following are some ICT facts on Singapore:

- €# The ICT sector contributed about \$25 billion in value-added (or 18 per cent) to Singapore's GDP in 1998 (*An occasional paper from Department of Statistics "The ICT sector in the Singapore Economy November 1998"*)
- €# The total ICT industry sales for hardware retail, software, telecommunications services, IT consultancy/services and online media in year 2001 was valued at about \$28 billion (*IDA Survey on Infocomm Industry 2001*)
- €# As at 2001, about 64% of the Singapore households own a personal computer and 57% of the Singapore households have access to the Internet (*IDA Survey on Infocomm Usage in Households 2001*)
- €# The number of mobile subscribers stood at 3,121,800 as at September 2002 (*IDA Monthly Telecommunication Statistics*)
- €# The number of Internet dial-up subscribers stood at 1,982,400 as at September 2002 (*IDA Monthly Telecommunication Statistics*)

The major ICT statistics available in Singapore can be categorized into the following four main groupings:

i) ICT Industry Statistics

Definition of ICT

Before any meaningful ICT sectoral data can be generated, the industrial composition of ICT sector has to be determined. There are currently two international definitions, namely the OECD definition and the North American Industry Classification System (NAICS). 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, emphasizes the development of information content and its transmission. In an occasional paper published by DOS "The ICT Sector in the Singapore Economy, November 1998", the definition of ICT-Singapore (ICT-S) encompass the entire chain of ICT-related activities, ranging from manufacturing to the distribution of ICT products, as well as high-tech and knowledge-based industries such as internet service providers, computer software development, publishing and computer schools. IDA on the other hand, excludes the manufacturing sector as this task is

under the purview of the Economic Development Board (EDB). A comparison of the ICT industries as defined by OECD, NAICS, DOS and IDA is presented in Annex A.

The industries are classified according to the Singapore Standard Industrial Classification (SSIC), which adopts the framework and principles of the International Standard Industrial Classification of all Economic Activities (ISIC). SSIC 2000 is the latest edition of the SSIC and has incorporated some new ICT industries, which have emerged in recent years. These include third party telecom/value-added network operators, web hosting services, cyber cafes, development of e-commerce applications and R&D in ICT.

The main sources of value-added data are the Census of Industrial Production and the Surveys of Commerce and Services. These are large-scale establishment surveys conducted annually to obtain detailed income and expenditures of establishments for the compilation of benchmark Gross Domestic Products (GDP) data.

Infocomm Industry Survey

Through the annual Infocomm Industry Survey, IDA collects statistics of the local ICT industries to determine the market size, performance, growth and contribution to the gross national product of Singapore. Some key indicators collected from this survey include:

- €# Total revenue of the ICT industry
- €# Domestic and export revenue of the ICT industry
- €# Percentage of the revenue generated by hardware technology, software technology, IT consultancy & services, telecommunications services and online media
- €# Total research and development expenditure

Infocomm Manpower and Skills Survey

Data on ICT manpower can be generated from surveys mentioned earlier i.e. Census of Industrial Production and the Surveys of Commerce and Services, which also collect data on employment and remuneration by industry. The ICT manpower data, which could be generated from these establishment surveys, are limited, as occupational data of workers within the ICT sector are not collected. More comprehensive data on ICT manpower can be generated from household surveys such as the Census of Population and General Household

Survey conducted by DOS and the Labour Force Survey ²conducted by the Ministry of Manpower (MOM). From these surveys, ICT manpower data can be generated by industry, occupation and income and tabulated against other demographic characteristics such as age, sex and education.

The occupational data are classified according to the Singapore Standard Occupational Classification (SSOC), which was essentially based on the International Standard Classification of Occupations (ISCO) published by the International Labour Organisation (ILO). SSOC 2000 is the latest edition and has incorporated some new ICT occupations such as network systems and data communications analyst, multi-media programmer, network and computer systems administrator, IT auditor and IT security.

To supplement the ICT manpower data available from the various surveys mentioned, the IDA also annually conducts an Infocomm Manpower³ and Skills Survey to determine the demographic characteristics, skills competency of ICT professionals in Singapore and assess the critical ICT skills needed by the establishments in Singapore. This survey assists IDA in formulating strategies to attract and develop ICT manpower and to ensure there is a constant pool of skilled ICT manpower to sustain Singapore's competitive edge in the international arena.

Among the indicators collected are:

- ⌘ Current and projected number of ICT manpower in Singapore
- ⌘ Turnover
- ⌘ Current and projected skill set required
- ⌘ Profile of ICT manpower
- ⌘ Amount spent on ICT training

ii) **ICT Demand Statistics**

² In Singapore, the Labour Force Survey is conducted in years where the Census of Population or General Household Survey are not conducted. All these surveys collect mainly social-economic data on the population.

³ Infocomm manpower refers to a person engaged primarily in Infocomm-related work either in an IT supplier, telecommunications vendor or end-user organisation (including government). The work of the person may include (a) development, distribution, implementation, support and operation of telecommunications, computer hardware/software and multi-media contents; (b) provision of information services to end-users; (c) dissemination of ICT knowledge and skills; or (d) management of the above processes.

The indicators in this category are mainly used to gauge the prevalence of ICT adoption. They could pertain to either households or establishments.

Infocomm Usage in Businesses

In tandem with the above area of concern, yearly statistics are also collected to assess the adoption and sophistication of usage of current and new ICT technologies by establishments in the major economic sectors in Singapore, through the Survey on Infocomm Usage in Businesses. Following are some key indicators obtained:

- ☞ Level of computer, Internet, Broadband and Wireless adoption
- ☞ Total ICT expenditure
- ☞ Barriers and motivation to adoption of ICT applications and services
- ☞ Current and planned usage of ICT in business processes

The IT and Internet revolution has created tremendous influences on the modus operandi of many companies worldwide. The above data provides useful inputs for the government to formulate appropriate policies to help companies adopt and exploit ICT in order to stay competitive and relevant in the knowledge-based economy.

Infocomm Usage in Households

The Survey on Infocomm Usage in Households is the main source of data on Infocomm usage among the Singapore households. The objective of the survey is to gauge the ownership and usage of Infocomm appliances as well as subscription to Infocomm services in the Singapore households. The following are some key indicators tracked from 1999 on a yearly basis:

- ☞ Percentage of households with computer and Internet access
- ☞ Demographic characteristics of users of PCs and Internet
- ☞ Type of activities conducted by computer and Internet users
- ☞ Ownership of other Infocomm products e.g. PDAs, mobile phones
- ☞ Barriers to home PC ownership, Internet access and online ICT usage

The Household Expenditure Survey conducted by DOS provides another source of data on Infocomm usage in households. The survey is conducted once in five years to update the weighting pattern and the basket of goods and services for the consumer price index (CPI). Home ownership of telephone, mobile phone, pager, fax and PC as well as Internet access are among the items tracked in the quinquennial survey.

Infocomm Literacy

In 2000, IDA initiated a Survey of Infocomm Literacy to assess the extent of Infocomm literacy among the Singapore's population. Some of the key indicators are collected and compiled for the residential population and workforce:

- ☞ Infocomm literacy
- ☞ Infocomm competent
- ☞ E-business competent

Monthly Statistics on Telecommunications

The telecommunications service providers also furnish monthly statistics on the number of subscribers for the following services:

- ☞ Fixed line services
- ☞ Mobile telephone services
- ☞ Paging services
- ☞ Dial-up Internet services
- ☞ International telephone services (in terms of call minutes)

The statistics are disseminated monthly via the IDA homepage.

iii) Electronic Commerce Statistics

Electronic commerce is a significant area of interest for IDA as the Singapore Government is positioning Singapore as an e-commerce hub. The government together with the IT industry partners and financial institutions, have been developing infrastructure services to support e-commerce such as on-line payment systems, trust and security systems, directory services, as

well as other intermediary e-commerce services. The first survey on e-commerce was launched by the Department of Statistics in Feb 1999 to collect detailed information on the nature, volume and composition of e-commerce transactions, as well as information on infrastructure supporting services. This survey is now jointly conducted with the RSU in IDA on an annual basis.

Among the major indicators collected in this survey are:

- ☞ Number of e-commerce enabled organisations
- ☞ Type of activities supported by the organisation's e-commerce network
- ☞ Total e-commerce B2B and B2C sales
- ☞ Total revenue generated by Internet infrastructure services, Internet applications infrastructure services and Internet intermediary services.
- ☞ Total investment in setting up the e-commerce infrastructure.

iv) Others

Quality of Service Statistics

As a regulator, IDA also collects quarterly data from the various telecommunications services providers in Singapore on quality of service indicators. These statistics are compiled every quarter by the Economic Regulation Department for public sharing. Some of these indicators are:

- ☞ Call success/drop-out rate
- ☞ Street level coverage
- ☞ Voice quality
- ☞ Service activation time
- ☞ Complaint rate

Ad-hoc Surveys

In addition to the above ICT statistics, IDA also conducts ad-hoc studies on the use of ICT. They are:

- ☞ The Broadband/Multimedia Industry Survey 2000

☞ Survey on Broadband and Wireless Usage 2001

☞ Survey on Infocomm Security 2001

v) **Challenges Faced in the Collection of ICT Statistics**

1. Providing timely and reliable statistics

The data collection programs must be able to provide relevant, timely and reliable statistics to policy makers and industry players that measure the impact of these changes. However, the technological developments are explosive. What is measured this month may no longer be valid the next month. Hence, there seems to be a need to conduct quarterly instead of annual surveys.

2. Blurring of the boundaries separating the ICT industries

The classification of ICT industries is challenged by the merging of technologies between information, communications and broadcasting. Products and services no longer be provided by exclusively by a single narrowly defined industry. These include publishing materials and broadcasting networks.

3. The rapid advancement of technologies

New technologies and products are developed every minute and the usages of these products will permeate into the lifestyle aspects of society. The challenge is to measure the social changes that are brought on by the usage of these products.

4. International comparability

Due to differing rates of technological achievement and advancement in different countries, there is a divergence in the focus of data collection internationally. A common language for data collection would be helpful to ensure that data collected in individual countries are comparable on an international basis. IDA, as an observer of the OECD Working Party on Indicators in the Information Society has adopted the same guidelines provided by the OECD on the definition of indicators so as to allow international comparison.

5. Privacy versus information

As increasing numbers of users utilise wireless applications, tracking users' preferences, purchasing history or even their physical location while using wireless applications becomes easier. Thus, information about purchasing behaviour, usage patterns etc. become more readily available. There is a concern about the privacy of an individual and the extent of how these information can/may be used. Hence, there is the challenge to find the appropriate balance that will enhance consumer confidence and yet provide access to information.

vi) Emerging Themes

The growing need for more ICT statistics has resulted in the planning of more projects for IDA RSU. Some of the other projects in the pipeline include:

- ☞ Survey on Mobile Commerce
- ☞ Survey on e-government services
- ☞ Survey on adoption and usage of Wireless technologies

In all these new endeavours, we look forward to collaboration and consultation with interested national statistical offices and international organisations in the areas of ICT research and development of indicators in the socio-economic, business and overall market environment. This includes issues relating to policy formulation such as ICT industry, business usage, e-commerce, mobile and wireless commerce etc.

Comparison of the ICT sector as defined by DOS, OECD, NAICS and IDA

	DOS	OECD	NAICS	IDA	
		SSIC 96		SSIC 96	SSIC 00
Manufacturing					
2210 Publishing	J		J		
22109 Publishing activities not elsewhere classified	J		J	J	74409
2230 Reproduction of recorded media	J				
3030 Mfg of insulated wires and cables	J	J			
3111 Mfg of semiconductor devices	J	J			
3119 Mfg of electronic valves and tubes	J	J			
3120 Mfg of communication equipment	J	J			
3130 Mfg of TV & radios, audio & video recorders	J	J			
3141 Mfg of computers and peripheral equipment	J	J			
3149 Mfg of other electronic equipment	J	J			
3212 Mfg of instruments for measuring, checking & testing	J	J			
3213 Mfg of industrial process equipment	J	J			
Wholesale and Retail Trade					
50521 Wholesale of pagers, handphones & telecom apparatus	J	J		J	J
50522 Wholesale of office machines & eqmt (incl accessories)	J	J		J	J
50523 Wholesale of computer hardware & peripheral equipment	J	J		J	J
50524 Wholesale of computer software	J	J		J	J
50525 Wholesale of computer accessories	J	J		J	J
50336 Wholesale of radio, TV etc	J				
50342 Wholesale of CDs, LDs, cassette tapes, musical instruments	J				
50515 Wholesale of telecom eqmt	J	J		J	J
50516 Wholesale of electrical & electronic components, wiring	J	J			
51436 Retail of radio, TV etc	J				
51452 Retail of CDs, LDs, cassette tapes, musical instruments	J				
51471 Retail of pagers, handphones & telcom apparatus	J	J		J	J
51472 Retail of calculators, typewriters & other office equipment	J	J			
51473 Retail of computer software, hardware & accessories	J	J		J	J
51474 Retail of computer & office eqmt consumables	J	J		J	J
Telecommunications					
64211 Fixed line services	J	J	J	J	J
64212 Mobile and radio paging services	J	J	J	J	J
64213 Satellite uplink and downlink services	J	J	J	J	J
64221 Internet service providers	J	J	J	J	J
64222 <i>Third party telecommunications/VA Network operator¹</i>				<i>new</i>	J
64223 <i>Web hosting services</i>				<i>new</i>	J
64224 <i>Cyber 'cafes'</i>				<i>new</i>	J
64229 Data communication services nec	J	J	J	J	J
64231 Television broadcasting	J		J	J	J
64232 Radio broadcasting	J		J	J	J
64240/64290 Telecommunications nec	J	J	J	J	64290
Computer-Related Services					
71221 Renting of computer and peripheral equipment	J	J		J	J
71222 Renting of office machinery and equipment	J	J			
72100 Hardware consultancy (include system consultancy)	J	J		J	72110
72201 Development of software & multimedia works	J	J	J	J	72209
72201 <i>Development of e-commerce applications</i>				<i>new</i>	J
72202 Publishing of software & multimedia works	J	J	J	J	74404

	DOS	OECD	NAICS	IDA	
		SSIC 96		SSIC 96	SSIC 00
72203 Software consultancy services	J	J	J	J	72120
72301 Computer timesharing	J	J	J	J	J
72302 Data entry services	J	J	J	J	J
72309 Data processing nec (e.g. data tabulation services)	J	J	J	J	J
72401 Publishing of directories & databases (inc info providing svces)	J	J	J	J	74405
72409 Other computer related activities nec	J	J	J	J	72909
72501 Maintenance & repair computer hardware etc	J	J		J	72401
72502 Maintenance & repair office machinery & eqmt	J	J			
72901 Computer facilities management services	J	J	J	J	J
72902 Computer systems integration services	J	J	J	J	J
72909 Other computer related activities nec	J	J	J	J	J
73100 Research and experimental development on IT	J			J	73105
74130 IT market research	J			J	74131
74300 Advertising	J			J	J
74911 IT manpower contracting services	J			J	J
74996 Art and graphic design services				J	74952
74997 <i>Call centres</i>				<i>new</i>	J
Business Information & Technical Services					
73100 (part) R&D on life sciences	J				
73100 (part) R&D on electronics	J				
73100 (part) R&D on chemicals	J				
73100 (part) R&D on engineering	J				
73100 (part) R&D on IT	J			J	73105
73100 (part) R&D on other natural sciences	J				
74130 (part) IT market research	J				
74130 (part) Other market research and public opinion polling nec	J				
74141 Business & mgmt consultancy services	J				
74211 Consultant engineering services	J				
74300 Advertising activities	J			J	J
74991 News agency activities	J		J	J	J
Other Services					
92111 Motion picture/video production	J		J	J	J
92112 Motion picture/video distribution	J		J	J	J
92113 Video filming & recording services	J		J	J	J
92114 (part) Motion picture/video/television post production svces	J		J	J	J
92114 (part) Svces allied to motion picture/video prdtn & distributn	J		J	J	92115
92121 Cinema services	J		J		
92129 Motion picture projection nec	J		J		
92131 TV programmes production & distribution	J		J	J	J
92132 Radio programmes production & distribution	J		J		
92139 <i>Other radio and television related activities</i>				<i>new</i>	J
92145-8 Other entertainment activities nec				J	92199
92199 Other entertainment activities nec				J	J
92210 Library & archives activities	J		J		
80203 IT education & training institutions	J			J	J
80913 <i>Distance learning infrastructure providers</i>				<i>new</i>	J

Note: ¹ Items in italics are defined in SSIC 2000 but not in SSIC 1996.