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Information and Communication Technology Penetration in Nigeria: Prospects, Challenges and Metrics

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Abstract: The International Telecommunications Union' statistics currently show that the Information and Communication Technology (ICT) industry had experienced continuous growth, as well as rapid progress in policy and technology development, resulting in an increasingly competitive and networked world. There are more ICT users worldwide and more people communicating than at any other time in history. It is also encouraging, that overall, the digital divide has been reduced, with statistics showing that within few years the gap separating the developing and the developed countries has been shrinking in terms of mobile subscribers, fixed telephone lines, access/subscriptions to satellite TVs and Internet usage. Despite these gains, we cannot deny the fact that the growth and development of ICT infrastructure and implementation in Nigeria are still faced with some challenges that has prevented the nation from maximizing the potentials offered by ICT and related technologies. This study presents an overview of the current status of growth and prospects of ICT penetration in Nigeria. Some of the challenges identified as militating against ICT expansion and indicators by which ICT penetration can be assessed based on International consensus were discussed. We conclude by positing that an understanding of these indicators will enhance the formulation of the right policies within the government sector and aid business and individuals in their pursuit of the benefits accruable from the dynamics of the information age.

Key words: ICT, penetration, statistics, infrastructure, implementation, PSTN, Nigeria

INTRODUCTION

Recognizing the potentials of Information and Communication Technologies (ICT) for accelerating economic development and enhancing the lives of individuals, the international community has stressed the importance of improving access to ICT, particularly in the developing world. Attention to this issue reached a turning point in 2000, when the G-8 Digital Opportunity Taskforce (DOT Force) was created to focus on bridging the digital divide (Fiona, 2003). Since 2000, however, much has changed in the global political, economic and technological landscape. International geopolitical tensions have escalated at the same time that the engines of economic growth have slowed in many parts of the world. Meanwhile, the technology sector has undergone massive and widespread consolidation and restructuring, including painful reassessment of investment strategies, mergers and product deployment. Only recently have we begun to see the recovery of the global economy and signs of increased activity in the technology sector.

Forms of communication that is devoid of modern ICT infrastructures, has been criticized due to delays experienced in the communication medium, as days if not months passed before a single piece of information could be transmitted from one place to another. Another important point raised by critiques was the cost of and reliability of the channel messages have to pass through. The Internet, which is the backbone of today's ICT, was developed, first, for military purposes but later grew into a tool for social interaction and has become a tool for fostering peace and unity among nations of the world.

In Nigeria, various means of disseminating information in the past consists of the Post offices, Town criers, Public Switch Telephone Network (PSTN), Telegram e.t.c. As ICT evolved, other mediums, which are faster, cheaper, portable and more reliable, came to play. The major ones in our country today are the Internet and the Global System for Mobile Communication (GSM). GSM products brought with it convenience, mobility and portability in the information and communication process. Today, Internet services are becoming available on mobile phones making it possible to transact a wide range of services formally. Fixed and mobile wireless systems offer key advantages in making internet services universally available because of the speed of deployment. Fast

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deployment means quicker connection to subscribers resulting in faster payback of capital investment. The rapid rate of deployment will also make phones services widely available and this will accelerate the pace of national economic development and growth.

Development of ICT in Nigeria: The first Information and Communication Technology (ICT) initiative in Nigeria started in the 1950s with focus on print and electronic media. No major policy or other outcome was achieved because of strict government control. The full awareness of the importance of ICTs was absent. Only the private sector demonstrated ICT initiatives. The Federal Government of Nigeria has recognized the import of information technology as a major key to economic growth and sustainability. That culminated in a workshop on ICT policy in Abuja in March 2000 which brought together major ICT stakeholders such as the Nigerian Computer Society (NCS), IT Association of Nigeria (ITAN), the Computer Professionals of Nigeria (CPN) and other major stakeholders in the public and the private sector.

With the collaboration of several committees, the ICT policy was produced and approved by the Federal Executive Council in March 2001 and has the National Information Technology Development Agency (NITDA) as implementing body (Ajayi, 2002). According to its vision statement, the policy is aimed at making Nigeria an IT capable country in Africa and a key player in the Information society by using ICT as the engine for sustainable development and global competitiveness. The mission statement, centers on using ICT for education, creation of wealth, poverty eradication, job creation and global competitiveness. NITDA is trying to increase the Internet penetration levels in Nigeria but the agency's focus is not particularly on the Internet ethics and content delivery. Availability of on-line facilities to the populace on a private level is still very low. Therefore, one has to go to a cyber café even for rudimentary net access such as e-mail, net conferencing, b rowsing, etc. (Longe and Longe, 2005).

Current trends in internet usage in Nigeria: The internet has become an important tool for business growth, social activities and research in Nigeria. While the interest is well integrated into education, business and social activities in North America, Europe and part of Asia, Nigeria can be said to be attempting giant strides in embracing its usefulness and applications. Internet/cyber cafes have sprung up in major cities, with majority of them in cities having educational Institutions and big commercial/business centres/activities. A large majority of Internet access is provided by these cyber cafes, Universities (and some other education Institutions) and very few business organizations that could afford them. Unlike the developed countries where individuals are well connected to the Internet via telephone service lines, individuals in Nigeria might not get connected due to several reasons.
These include:

- Absence of adequate communication network infrastructures.
- Relatively high cost of equipment that could not be afforded by the large low-income portion of the Nigerian population.
- Lack of government interest and support.
- Problems associated with technical and management support for Internet connection.

Several authors have discussed these problems and their potential solutions (Ahiakwo, 2002; Anao, 2002; Longe and Chiemeke, 2006). In Nigeria, the Executive Vice Chairman of Nigeria Communication Commission (NCC), Ernest Ndukwe, described the level of Internet penetration as very low, blaming these on high cost of bandwidth, computers and Internet infrastructure, as well as unreliable power supply (Nwankwo, 2006). A casual investigation of the Nigerian ICT terrain reveal, that wireless network will grow faster than wired network. This fact is supported by the rapid increase in mobile telephone subscribers in recent years. The major challenges facing ICT penetration can therefore be summarized under the following categories:

- The challenges of sustainable wired and wireless networks
- Cost of connection
- Security issues
- Political Instability/Policy inconsistencies and
- Lack of effective coordination.

Correlating ICT with socio-economic roles development: One of the most potential benefits of the IT revolution concerns the opportunities that become open to Nigerian businesses to access a wider global market through e-commerce. As e-commerce opens up the Nigerian market to foreign enterprises, the relatively affluent Nigerian consumer with access to the Internet is given much greater choice with regard to desired products and services. Nigeria has much to gain from the revolution in communication and information access. In contrast to the situation in the developed world, where transport and communications vinfrastructures for delivery of both

physical goods and information services are well established, the alternatives available in Nigeria are generally slow, expensive, or nonexistent. The communications and information delivery capability of ICT products and related services serves all sectors of society. The areas of education, health, social policy, commerce and trade, government, agriculture, communications and science and technology all benefit from access powered by ICT. These resources are interlinked and synergistic, individuals can visit and exploit relevant information sources, which often point to additional sources of information and to knowledgeable individuals.

The correlation between information, communication and economic growth is well know, making the usefulness of networks nearly self-evident. Electronic networking is a powerful, rapid and inexpensive way to communicate and to exchange information. When networks are available, previously unanticipated collaboration seems to come into being almost spontaneously. The underlying cause seems to involve a latent demand that remains latent as long as joint work requires either the disruption of waiting for the mail, the continual retyping of texts transmitted by mail or fax, or the need to secure large budgets and approvals for extensive international travel.

In Nigeria networking is now crucial to scientific research and development efforts, many of which yield tangible economic benefits. The country's commercial/economic growth is enhanced by access to information and improved contact with support and purchasing personnel as well as customers. Access to GSM and satellite TV networks also improves the effectiveness of the development of communities, comprising representatives of international agencies, staff of non-governmental organization and others working locally and abroad. In addition, Nigerian Universities are focusing on curricula that might contribute more directly to economic growth and network connections.

Information poverty and its implications: In Nigeria, information poverty is one of the more significant and insidious obstacles to effective exploitation of information processing and other types of technology. Lack of adequate information regarding development in other countries and other environments is often not noticed and in the absence of new information, old techniques and procedures are continuously used without conscious knowledge of alternatives. Other contextual constraints may be present. In Nigeria, information poverty, financial poverty and misperceptions about the costs and benefits of network connectivity have sometimes resulted in decisions to delay investment in ICT infrastructures which may be considered too expensive relative to other needs.

For Educational and technical performance the Internet is a must because it will give all the information we can possibly desire. Nigerian researchers often hardly know what their colleagues at other Universities are doing and they lack the capability to disseminate their own research results throughout the world. At the same time the extreme shortage of academic publications in practically all Nigerian Universities could be remedied with a robust Internet link and other powerful computing resources.

MEASURING ICT PENETRATION

Today, almost every country in the world has a direct connection to the Internet. Although this is an impressive achievement, ICT penetration levels vary among and within countries, creating a digital divide between those with high and those with low access levels. If it is time to measure the information society, it is also time to rethink traditional indicators. The convergence of ICT industries and the new emphasis on addressing the digital divide, has led to the need for a set of policy-oriented information society statistics. Although a number of ICT indicators already exist, they are often inappropriate for policy analysis; few countries collect pragmatic indicators for measuring access and even where they exist, international comparisons are often hampered by differences in definition and methodologies. They are also typically derived from administrative records rather than from purpose-built surveys. This statistical divide is as great as or even greater than the digital divide.

ICT penetration indicators: Comparable statistics on access to and use of, Information and Communication Technologies (ICTs), are critical to formulating policies and strategies concerning ICT-enabled growth, for social inclusion and cohesion and for monitoring and evaluating the impact of ICTs on economic and social developments. However, comparable information society statistics are very limited particularly in the developing world (UN, 2005).

The core list developed by the UN in the study above contains four sets of indicators thus

- ICT infrastructure and access
- Access to and use of, ICT by households and individuals
- Use of ICT by businesses and
- ICT sector and trade in ICT goods.

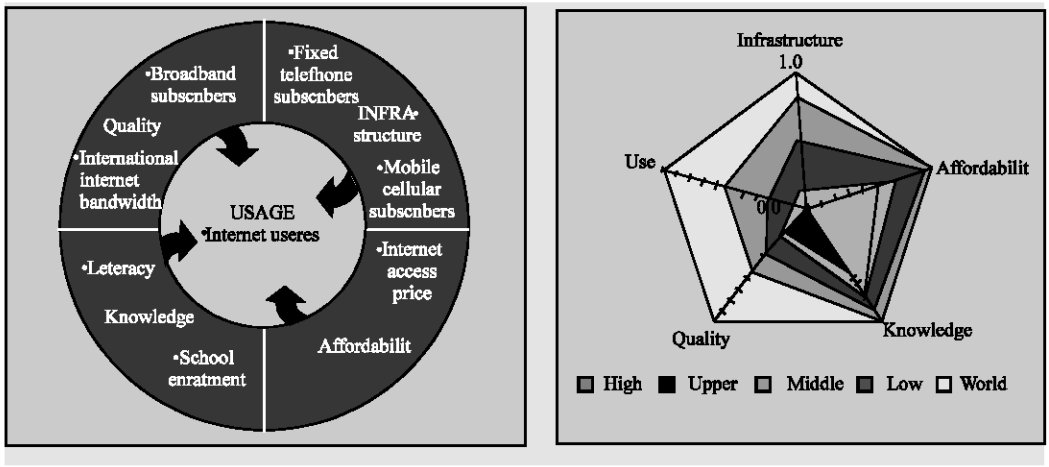

Fig. 1: Indicators making up the digital access index and values (Source: ITU, 2005)

The ITU parameters for measuring ICT penetration is depicted in the Fig. 1.

The principal objective of the list is to help countries which are developing ICT surveys, or adding ICT questions to existing collections, to produce internationally comparable data. It is recognised that not all countries are at the same level of development or have well developed statistical systems. In respect of the indicators for which countries would need to collect data (generally those on ICT access and use and the ICT sector), countries with little or no ICT infrastructure may not see the need to collect those ICT statistics at this stage. Countries with growing use of ICT may want to monitor this growth by starting to measure ICT use while others, with higher levels of ICT use and perhaps a growing ICT sector, may want to go further. Until recently, infrastructure had been considered as the main obstacle to improving access to ICTs. Existing indicators are therefore often infrastructure-based, measuring such variables as the number of main telephone lines and typically use telecommunication operators' data. But there is growing evidence that other factors, such as affordability and knowledge, are an important part of the access picture. It is widely recognized that new indicators are needed (ITU, 2005)

Access to ICTs in Nigeria: The answer to the question of level of access to ICT in Nigeria will depend largely on how ICT accesses are measured. The *conventional* way is to divide the number of access devices or services by the total population. While such *per capita* measures are convenient and useful for comparing general differences between and within countries, they can be misleading.

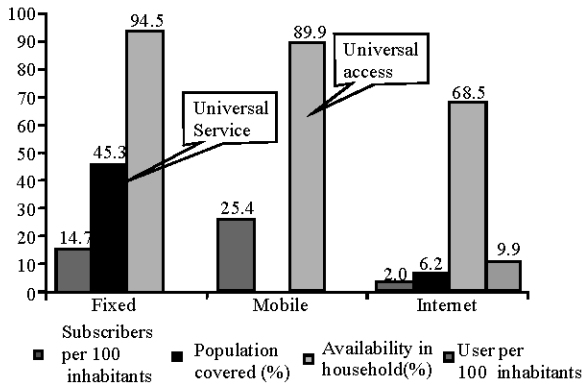

Fig. 2: Possession, access and use in Mexico (Source: ITU indicators database, 2005

This is because a per capita indicator does not reflect the socio-demographic composition of the nation. For example, if there are 1000 mobile lines in Nigeria, all owned by the same person, is our nation better off than a country with 500 telephone lines owned by 500 different people? Is a country with fewer mobile lines but larger households worse off than a country with more lines and smaller households? Per capita measures also fail to take into account the principles of sharing of communication infrastructures in households or of computers in Internet cafés, for instance. They also fail to take into account access to ICTs through the workplace, school or through government initiatives. The lack of detailed breakdown of data provided by per capita measures also makes it impossible to set specific targets. The fact that most ICT access analysis rely on such conventional indicators can often result in mistaken assumptions.

Taking the example of another developing nation , the illustration in Fig. 1 reveals the misguided information offered by the mistaken assumptions discussed earlier. According to the conventional measure of telephone penetration, the number of fixed telephone lines per 100 inhabitants in Mexico is 14.7 (ITU Report, 2005). From this it might be deduced that 85% of the population does not have access to a telephone. But the figure does not take into account mobile telephone subscribers, nor does it include those that otherwise have access to the telephone service: 45 % of households have a fixed telephone, while 95% of the population lives in communities with a public telephone service. In the case of the Internet too, Mexico's relatively low subscription penetration, two %, disguises the fact that almost 70% of the population has access to the Internet through private or government-sponsored Internet cafés (Fig. 2).

A more precise way of measuring access is to examine the availability of ICTs in households. *Universal service* - a fundamental regulatory concern - is quantified in this way and is measured as a percentage.

In most developing countries household penetration rates are low for newer ICTs, Nigeria not being an exemption. Therefore additional ways of analyzing access are needed, that focus more on overall availability (Table 1).

UNIVERSAL ACCESS INDICATORS FOR MEASURING ICT PENETRATION

Universal access indicators reflect the level of the population that is covered by ICTs. These indicators are typically expressed as the percentage of a country's inhabitants or households for which an ICT service is theoretically available. Universal access indicators are important because they help identify barriers to ICT use. A high level of ICT coverage but low level of use suggests that other barriers besides infrastructure are the bottleneck. As is the case in Nigeria today, inhabitants may not use an ICT service for different reasons. These may include lack of interest, illiteracy, lack of awareness or inability to pay. This should be a fundamental indicator for developing nations, yet few actively compile appropriate statistics on the level of universal access. The adapted data from a survey carried out in South African (ITU, 2005) depicted below offer an example of how both universal service and access data can be captured in the same survey (Table 2). A second section has been included reflecting figures from a survey carried out in Auchi, Nigeria as a simple measure of access in a sub-urban community in Nigeria.

Table 1: Digital access index value by access level, 2002

High access		Upper access		Middle access		Low access	
Sweden	0.85	Ireland	0.69	Belarus	0.49	Zimbabwe	0.29
Denmark	0.83	Cyprus	0.68	Lebanon	0.48	Hondurs	0.29
Iceland	0.82	Estonia	0.67	Thailand	0.48	Syria	0.28
Koria (Rep)	0.82	Spain	0.67	Romania	0.48	Papua New Guinea	0.26
Norway	0.79	Malta	0.67	Turkey	0.48	Vanautu	0.24
Netherlands	0.79	Czech Republic	0.66	TFYR Macedonia	0.48	Pakistan	0.24
Hong Kong China	0.79	Greece	0.66	Panama	0.47	Azerbaijan	0.24
Finland	0.79	Portugal	0.65	Venezuela	0.47	S. Tome and Principe	0.23
Taiwan China	0.79	United Arab Emirates	0.64	Belize	0.47	Tajikistan	0.21
Canada	0.78	Macao china	0.64	St. Vincet	0.46	Equatorial Guinea	0.20
United states	0.78	Hungary	0.63	Bosnia	0.46	Kenya	0.19
United Kingdom	0.77	Bahamas	0.62	Surinama	0.46	Nicaragua	0.19
Switzerland	0.76	St. Kitts and Nevis	0.60	South Africa	0.45	Lesotho	0.19
Singapore	0.75	Poland	0.59	Colombia	0.45	Nepal	0.19
Japan	0.75	Solvak Republic	0.59	Jordan	0.45	Bangladesh	0.18
Luxembourg	0.75	Croatia	0.59	Serbia and Montenegro	0.45	Yemen	0.18
Austria	0.75	Bahrain	0.58	Saudi Arabia	0.44	Togo	0.18
Germany	0.74	Chile	0.58	Peru	0.44	Solomon Island	0.17
Australia	0.74	Antigua and Barbuda	0.57	China	0.43	Uganda	0.17
Belgium	0.74	Barbados	0.57	Fiji	0.43	Zambia	0.17
New Zealand	0.72	Malaysia	0.57	Botswana	0.43	Myanmar	0.17
Italy	0.72	Lithuania	0.56	Iran (IR)	0.43	Congo	0.17
France	0.72	Qatar	0.55	Ukraine	0.43	Cameroon	0.16
Slovenia	0.72	Brunei Darussalam	0.55	Guyana	0.43	Cambodia	0.16
Israel	0.70	Latvia	0.54	Philppines	0.43	Lao P.D.R.	0.15
		Uruguay	0.54	Oman	0.43	Ghana	0.15
		Scychelles	0.54	Maldives	0.43	Malavi	0.15
		Dominica	0.54	Libya	0.42	Tanzania	0.15
		Argentina	0.53	Dominican Rep	0.42	Haiti	0.15
		Trinidad and Tobago	0.53	Tunisia	0.41	Nigeria	0.15
		Bulgaria	0.53	Ecuador	0.41	Djibouti	0.15
		Jamaica	0.53	Kazakhstan	0.41	Rwanda	0.15

Table 1 continued

High access	Upper access		Middle access		Low access	
	Costa Rice	0.52	Egypt	0.40	Madagascar	0.15
	St. Lucia	0.52	Cape Verde	0.39	Mauritania	0.14
	Kuwait	0.51	Albania	0.39	Senegal	0.14
	Grenada	0.51	Paraguay	0.39	Gambia	0.13
	Mauritius	0.50	Namibia	0.39	Bhutan	0.13
	Russia	0.50	Guatemala	0.38	Sudan	0.13
	Mexico	0.50	EI Salvador	0.38	Comoros	0.13
	Brazil	0.50	Palestine	0.38	Cote d'Ivoire	0.13
			Sri Lanka	0.38	Eritrea	0.13
			Bolivia	0.38	D.R. Congo	0.12
			Cuba	0.38	Benin	0.12
			Samoa	0.37	Mozambique	0.12
			Algeria	0.37	Angola	0.11
			Turkmenistan	0.37	Burundi	0.10
			Georgia	0.37	Guinea	0.10
			Swaziland	0.37	Sierra Leone	0.10
			Molodova	0.37	Central African Rep	0.10
			Mongolia	0.35	Ethiopia	0.10
			Indonesia	0.34	Guinea-Bissau	0.10
			Gabon	0.34	Chad	0.10
			Morocco	0.33	Mali	0.09
			India	0.32	Burkina Faso	0.08
			Kyrgyzstan	0.32	Niger	0.04
			Uzbekistan	0.31		
			Viet Nam	0.31		
			Armenia	0.30		

Table 2: Universal service and ICT access measurements (Fixed and cell phones (GSM)-Nigeria and South Africa

South Africa access to phones			Nigeria Access to Phones		
Telephone and cell phone at home	14.2%	Universal	Telephone and cell	8.2%	Universal
Telephone at home	10.2%	service	phone at home		service
Cellphone at home	18.0%	(US) =	Telephone at home	3.1%	(US) =
At a neighbour nearby		42.4%	Cellphone at home	22.3%	33.6%
At a public telephone nearby	6.6%	Universal	At a neighbour nearby	1.2%	Universal
At another location nearby	38.5%	Access	At a public telephone nearby	28.2	Access
At another location, not nearby	3.2%	(UA) =	At another location nearby	2.1%	(UA)
	3.4%	94.0%	At another location, not nearby	1.5%	= 68.6%
No access to a telephone (NA)	6.0%		No access to a telephone	31.4	
Total Possible Access (TPA)	100.0		Total Possible Access (TPA)	100	

In the context of our writing, Inconvenient Access (ICA) is measured by: Total Possible Access (TPA)-Universal Service (US)+No Access (NA), For South Africa, this is given by 100-(42.4+6.0)% = 51.6%, For Nigeria, this is given by 100-(33.6+31.4)% = 65.0%

Obviously, more South Africans have convenient access to phone services than Nigerians despite the fact that more Nigerians have access to phones at home. It is also useful to compile *usage* statistics. While the categories described above give an indication of the availability of infrastructure, the *number of users* measures the actual utilization of a given service. The level of universal service for an ICT is dependent on a country's income. Nigeria with significant rural populations will have to pursue a high level of universal service in urban areas and widespread universal access in rural ones. This should be one of the key focus of the Nigerian Information Technology Development Association (NITDA).

Our nation's ICT new environment, with a growing emphasis on reducing the digital divide, requires access and usage indicators disaggregated by socio-economic categories such as age, gender, income and location. To measure the ICT picture in full, new multi-stakeholder partnerships will be required involving not only the statistical agencies that are traditionally responsible for conducting surveys, but also policy-makers, the private sector, civil society, multilateral organisations, academic research and others involved the ICT arena.

CONCLUSION

While some developed nations are racing ahead in measurement, tracking a multitude of factors such as ICT infrastructure, access, usage, volume and value, many

developing nations are struggling to produce even basic ICT indicators. A globally relevant approach needs to concentrate on trends that can be measured to a comparable extent in *all* countries, not just those already collecting data. In this study, we have outlined the current trend in ICT usage in Nigeria while also shedding light on the areas of challenges. We argue that *access* to ICTs is doubtless the most fundamental prerequisite for an inclusive information society. Measuring access is therefore a key priority for a set of indicators that are relevant in order to judge the effect of ICT on the socio-economic growth of our nation.

RECOMMENDATION

In order to move towards an inclusive information society, countries need meaningful data to identify disparities in access, to track progress and to make international comparisons. Only then can policy-makers and the private sector effectively target underserved segments of society. It is crucial to understand who has access and where and how people use ICTs, in both developing and developed countries. Based on the International Telecommunications 2005 Report, we recommend the indices below as indicators for measuring ICT penetration in Nigeria.

Indicators on ICT Infrastructure and Access

- Fixed telephone lines per 100 inhabitants
- Mobile cellular subscribers per 100 inhabitants
- Computers per 100 inhabitants
- Internet subscribers per 100 inhabitants
- Percentage of population covered by mobile cellular telephony
- Percentage of localities with Public Internet Access Centres (PIACs) by number of inhabitants (rural/urban)

Indicators on access to and use of ICT by households and individuals

- Proportion of households with satellite/cable TV connections
- Proportion of households with a fixed line telephone
- Proportion of households with a mobile cellular telephone
- Proportion of households with a computer
- Proportion of individuals who used a computer (from any location) in the last 12 months
- Proportion of households with Internet access at home
- Proportion of individuals who used the Internet (from any location) in the last 12 months
- Location of individual use of the Internet in the last 12 months: (a) at home; (b) at work; (c) place of education; (d) at another person's home; (e) community Internet access facility (specific denomination depends on national practices)4; (f) commercial Internet access facility (specific denomination depends on national practices)5; and (g) others
- Internet activities undertaken by individuals in the last 12 months
- Getting information: (a) about goods or services; (b) related to health or health services; (c) from government organisations/public authorities via websites or email; and (d) other information or general Web browsing

Indicators of ICT usage by businesses

- Proportion of businesses using computers
- Proportion of employees using computers
- Proportion of businesses using the Internet
- Proportion of employees using the Internet
- Proportion of businesses with a Web presence
- Proportion of businesses with an intranet
- Proportion of businesses receiving orders over the Internet
- Proportion of businesses placing orders over the Internet

Indicators on the ICT sector and trade in ICT goods

- Proportion of total business sector workforce involved in the ICT sector
- Value added in the ICT sector (as a percentage of total business sector value added)
- ICT goods imports as a percentage of total imports
- ICT goods exports as a percentage of total exports

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