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ICT AND E-BUSINESS: SELECTED TRENDS AND ISSUES ON THE ICT FOR DEVELOPMENT AGENDA*

Note by the UNCTAD secretariat

Executive Summary

This note presents some conclusions of the work carried out by the secretariat in the area of e-business, ICT and development since the ninth session of the Commission. It provides information concerning basic trends in the spread and usage of ICT with a focus on developing countries. It also includes the secretariat's analysis of the implications for the wider usage of ICT in developing countries of several issues on the international agenda. The note closes with suggestions about how could contribute to international efforts to implement the outcome of the second phase of the World Summit on the Information Society (Tunis, 16–18 November 2005).

* This document was submitted on the above-mentioned date as a result of processing delays.

CONTENTS

I. INTRODUCTION

1. This paper is based on the results of the work carried out by UNCTAD in the field of ICT, e-business and development in implementation of the mandate received in São Paulo and of the recommendations made by the Commission at its ninth session (22–25 February 2005).

2. The Commission recommended that UNCTAD should, among other things, analyse the trade and development aspects of ICT and e-business, paying particular attention to relevant international discussions, and including in the context of the World Summit on the Information Society (WSIS). It was recommended that work on the measurement of ICT should be continued. The Commission further recommended that, without prejudice to other technology and content models, UNCTAD should provide advisory services to developing countries on free and open source software in the context of its capacity-building activities and of the multi-stakeholder partnerships launched at UNCTAD XI.

3. In order to implement these recommendations, the secretariat has advanced in its work in the area of e-measurement, particularly in the framework of the UNCTAD XI Partnership on Measuring ICT for Development, focusing on the collection of data and information on ICT usage by enterprises. This information, together with the results of research and analysis work on a number of ICT, e-business and development issues, were disseminated through the *Information Economy Report 2005* (IER 05), as well as through the organization of and participation in several international events, particularly in the context of the WSIS process.

4. In order to facilitate the Commission's consideration of this agenda item on ICT and e-business for development, this note presents information on ICT usage and other aspects of UNCTAD's recent work in this area. Interested readers are encouraged to refer to the IER 05 for further information about these matters and about others that have been addressed by UNCTAD's research but that are not discussed here.[1] For example, research in the field of e-tourism contributed to, and was complemented by, the outcome of an expert meeting on the subject that was held in November 2005. The report of the expert meeting is contained in document TD/B/COM.3/EM.25/3. Information and analysis about other aspects of ICT, e-business and development were also addressed by the predecessor publication to the IER, the *E-commerce and Development Report*[2] which provides the wider context in which the selection of topics treated here should be understood.

5. This paper is structured as follows: Part I contains some basic data about recent trends in access and usage of ICT, particularly in what concerns ICT business applications. Turning to some relevant issues on the international agenda on ICT, Part II looks at the cost of backbone connectivity for developing countries and Part III outlines some international and development aspects of cybercrime and Internet security, as well as a key application of ICT for development, namely e-credit information. Part IV makes suggestions about the practical way in which UNCTAD's work in the field of ICT and e-business could contribute to the implementation of WSIS follow-up embodied in the Tunis Agenda.

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[1] This report can be found at http://www.unctad.org/en/docs/sdteedc20051_en.pdf.

[2] The E-commerce and Development Report was published annually between 2001 and 2004. All past issues are available on UNCTAD's website.

II. QUANTITATIVE ASPECTS OF ICT, E-BUSINESS AND DEVELOPMENT: RECENT DEVELOPMENTS

A. Global and regional trends in access to ICT

6. During 2005, ICT have continued to spread in all regions of the world, and particularly in the developing countries. A growing number of enterprises are enhancing their competitiveness by applying ICT to their business processes. At the same time, many developing countries face serious challenges for the establishment of their information societies and will need sustained international efforts in order for the economic and social benefits of ICT to reach their populations.

Internet users

7. According to data from the International Telecommunication Union (ITU), the number of Internet users continues to grow at a fast pace, having reached 875.6 million at the end of 2004, a 22.7 per cent increased compared to 2003. Asia is now the continent with the largest Internet population, followed by Europe, while Africa experienced the highest growth rate between 2003 and 2004. In terms of countries, the United States has the largest Internet population, with over 185 million at the end of 2004, about twice as many as the second, China. Developing countries continue to catch up and at the end of 2004 they accounted for 38 per cent of all Internet users in the world, up from 25 per cent in 2000. Over the same period, the share of the world's Internet population of South-East Europe and CIS countries more than doubled (from 2 per cent to 5 per cent) while that of the developed countries went down from 73 per cent to 57 per cent. (Source: ITU World Telecommunication Indicators database, 2005).

Table 1. Number of Internet users by region and level of development, 2003–2004 (in thousands)

	2003	Change (%) 2003-2004	2004
Region			
Africa	13 097	66.6	21 814
Asia	255 669	28.6	328 887
Europe	201 324	20.7	242 951
Latin America and Caribbean	50 995	18.7	60 534
North America	179 232	14.4	205 000
Oceania	13 581	21.1	16 446
Level of development			
Developed countries	433 308	15.8	501 756
Developing countries	256 846	29.6	332 998
South-East Europe and CIS	23 745	72.2	40 877
Total	**713 899**	**22.7**	**875 632**

Source: UNCTAD calculations based on ITU World Telecommunication Indicators database, 2005.

8. While in terms of the absolute number of Internet users developing countries already represent a very significant part of the global Internet, Internet penetration figures (i.e. users per 100 inhabitants) provide a different perspective into the relative access to the Internet. Worldwide, 14.3 per cent of the population had access to Internet at the end of 2004. The Republic of Korea has overtaken the United States and now ranks number three worldwide (after New Zealand and Sweden), with a penetration rate of 65.7 per cent. In China, the second largest Internet market in 2004 as far as number of users is concerned, penetration is growing by 16.4 per cent. However, with 7.2 per cent penetration, only a small proportion of China's population uses the Internet. The gap between developed and developing countries continues to be impressive, although developing countries are slowly catching up. As shown in Table 2, only 3.1 per cent of Africans had access to the Internet in 2004, compared with 62.6 per cent of North Americans. The relatively low penetration rates shown in Europe can be explained by penetration rates in several South-Eastern European countries while, according to Eurostat data, the average penetration rate in the EU15 is 50 per cent.

Table 2. Internet penetration by region and level of development, 2003–2004

	2003	Change (%) 2003-2004	2004
Region			
Africa	1.9	63.1	3.1
Asia	6.8	27.1	8.7
Europe	27.5	20.7	33.2
Latin America and the Caribbean	9.7	17.1	11.4
North America	55.3	13.3	62.6
Oceania	52.6	19.7	63.0
Level of development			
Developed countries	45.9	15.2	52.9
Developing countries	5.4	27.9	6.9
South East Europe and CIS	7.2	72.6	12.5
Total	**11.8**	**21.3**	**14.3**

Source: UNCTAD calculations based on ITU World Telecommunication Indicators database, 2005.

Broadband

9. By speeding up all Internet-related business activities, such as transferring web pages and data files, handling customer requests or automating supply chain management, broadband enables companies to work more efficiently and respond more quickly to customers' needs. For certain e-business solutions, broadband has thus become indispensable. It also supports the outsourcing of certain applications, distance learning and telecommuting.

In industries whose operations involve the exchange of large data files, broadband is particularly important.

10. Asia is the only developing region that has reached any significant broadband penetration. Even though subscriber growth rates in Africa and Latin America are very high, it will take years before they reach the levels of Asia, Europe or North America. Especially in Africa where the number of broadband subscribers in most countries is extremely small, and penetration rates are less than 1 per cent even in countries that are more advanced in ICT. The digital divide in terms of broadband has serious implications for enterprises in many less developed countries. While previous research (see UNCTAD's *E-commerce and Development Report 2004*) has shown that dial-up access is sufficient for companies to start moving online, advanced applications such as online ordering, customer acquisition and retention, finance and account management, product service and support, or logistics and inventory control, will benefit significantly from high-speed access. Most ICT-related productivity gains could be achieved in these areas. For developing countries enterprises to achieve a more integrated adoption of ICT in their business processes, it will be crucial to enhance the reliability and speed of available Internet access.

Computers

11. Computers remain the most important means of access to the Internet and of ICT use in business processes. Available statistical data (ITU World Communications Database) show that there is continued growth in the number of computers worldwide (Table 3). While in 2003 the countries with highest growth were all developing or transition economy countries (China, Brazil, the Russian Federation, Mexico, India, the Islamic Republic of Iran and Malaysia), when it comes to computer penetration, even these countries show rates similar to most low-income countries. Overall, computer penetration rates are very similar to Internet penetration rates. However, these figures do not represent the number of computer users. Computers are often shared and the rate of sharing in developing countries is higher than in developed countries. This is particularly the case at the household and individual user level, but even small enterprises in rural areas often access computers in local village community centres and similar public places. In the absence of better data on the use of computers, the above figures suggest that the gap in computer use penetration rates between developed and developing countries is smaller than the gap in Internet user penetration rates. This leaves further room for increasing Internet user penetration in developing countries, based on computer access, given the same number of computers.

Table 3. Personal computers by region and level of development, 2003–2004

	2003			2004	
	Number of PCs (in thousands)	Penetration	Change (%) 2003–2004	Number of PCs (in thousands)	Penetration
Region					
Africa	11 449	1.4	13.4	13 257	1.6
Asia	186 938	5.1	17.2	221 654	6.0
Europe	185 009	25.7	19.8	221 568	30.8
Latin America and the Caribbean	41 099	7.8	13.9	47 487	8.9
North America	216 663	66.8	10.8	242 390	74.0
Oceania	14 256	45.2	11.9	16 157	50.6
Level of Development					
Developed countries	448 293	47.5	16.0	522 785	55.1
Developing countries	185 914	3.8	13.1	213 244	4.3
South-East Europe and CIS	21 208	7.9	25.5	26 483	10.0
Total	**655 414**	**10.8**	**15.0**	**762 512**	**12.4**

Source: UNCTAD calculations based on ITU World Telecommunication Indicators database, 2005.

Mobile phones

12. According to World Bank estimates, nearly 80 per cent of the world's population is now able to access mobile telephony networks and the number of subscribers keeps increasing at a very rapid rate, with the most significant growth taking place in developing countries. In 2003 developing countries overtook developed countries in terms of absolute numbers of cellular subscribers, making mobile phones the only ICT indicator where developing countries have higher shares than developed countries (see Table 4).

Table 4. Mobile phone subscribers by region and level of development, 2003–2004
(in thousands)

	2003	Change (%) 2003–2004	2004
Region			
Africa	51 313	56.1	80 103
Asia	598 436	24.7	745 993
Europe	445 854	23.0	548 367
Latin America and the Caribbean	124 043	39.5	173 002
North America	171 950	14.0	196 089
Oceania	17 180	15.1	19 779
Level of development			
Developed countries	662 395	11.8	740 630
Developing countries	677 854	32.0	894 932
South-East Europe and CIS	68 526	86.5	127 771
Total	**1 408 775**	**25.2**	**1 763 333**

Source: UNCTAD calculations based on ITU World Telecommunication Indicators database, 2005.

13. In order to get a more realistic picture of the distribution of mobile phones among users, penetration rates (subscribers per 100 inhabitants) need to be taken into consideration (Table 5). Although these are over four times lower in developing than in developed countries, the trend remains a positive one. In developing countries mobile phones are frequently shared by several people, hence the total number of people who have some kind of access to mobile phones is not captured in this table. However, full mobile telephony penetration is as desirable in developing as it is in developed countries.

Table 5. Mobile phone penetration by region and level of development, 2003–2004

	2003	Change (%) 2003–2004	2004
Region			
Africa	6.1	52.9	9.4
Asia	15.8	23.2	19.5
Europe	60.8	23.0	74.7
Latin America and the Caribbean	23.1	37.5	31.8
North America	53.0	13.0	59.9
Oceania	66.5	13.8	75.7
Level of development			
Developed countries	69.7	11.2	77.5
Developing countries	13.7	30.2	17.8
South-East Europe and CIS	20.5	86.9	38.4
Total	**22.6**	**23.7**	**27.9**

Source: UNCTAD calculations based on ITU World Telecommunication Indicators database, 2005.

14. Growth in mobile telephony can have significant implications for economic development. According to a recent study by researchers at the London Business School, an increase of 10 mobile phones per 100 people in African countries would increase GDP growth by 0.6 per cent.[3] It is argued that mobile telephony is the information and communication technology that has the most significant impact on development, particularly in developing and least developed countries. In these countries, mobile phones are used for more than simple communication, and are more often used as a business tool for producers and buyers to shop around for prices and for vendors to be paid. The importance accorded to these economic benefits is reflected in the larger share of income that developing country users spend on telecommunications as compared with users in developed countries.

B. ICT access and use in enterprises

15. Many of the efficiency gains related to the adoption of ICT result from changes in business processes, such as logistics and inventory control, order fulfilment and tracking, and customer acquisition and retention. Also, the growing adoption of ICT by businesses in developing countries can be analysed for its impact on development, and better data on ICT readiness, use and impact are needed in order to design, implement and evaluate ICT development policies. The UNCTAD secretariat launched an annual data collection exercise to compile e-business statistics from developing countries. On the basis of the list of core ICT indicators agreed upon at the WSIS Thematic Meeting on Measuring the Information Society, an extended group of selected developing countries were surveyed in 2005 regarding their

[3] Waverman L, Meschi M and Fuss M. The impact of telecoms on economic growth in developing countries, in *Vodaphone Policy Paper Series*, Number 2, March 2005, pp. 10–23, www.vodafone.com/assets/files/en/GPP%20SIM%20paper.pdf.

e-business statistics.[4] While the data are still very limited, they give an initial indication on the adoption of ICT by enterprises in developing countries. OECD and Eurostat provide complementary data on developed countries.

Internet access and use

16. In developed countries, a very high proportion of enterprises are connected to the Internet. As a group, OECD countries also show high proportions of Internet access by enterprises, although differences persist among them as well as between SMEs and large enterprises. It is harder to obtain comparable information on Internet access by enterprises in developing countries. The diversity of surveys conducted in developing countries affects the comparability between countries and makes it difficult to draw conclusions.

17. Although several developing countries such as the Republic of Korea (94 per cent), Trinidad and Tobago (77 per cent) and Singapore (76 per cent) report high percentages of Internet access by enterprises, on a par with developed countries, others report very low proportions, such as Mauritius (5 per cent) and Thailand (9 per cent). There is virtually no information on Internet access by enterprises disaggregated by urban or rural areas, although it is likely that results for some countries have a strong bias towards urban areas. Nonetheless, in the cases in which data are disaggregated according to the size of enterprises, it appears that also in developing countries access to Internet is more prevalent among larger businesses.

18. Regarding modes of access to the Internet in enterprises, these are not always equally defined and there are significant differences among countries. For example, Eurostat data show that, in 2004, the percentage of enterprises with broadband access reached 61 per cent for the EU 15 and 58 per cent for the EU 25. Although the proportion of enterprises with broadband access increases with the size of the enterprise, recent growth in adoption has been stronger among SMEs. Data from developing countries indicate that, with the exception of some Asian economies, most businesses that connect to the Internet do so through an analogue modem or with fixed line connections under 2 Mbps. Regarding the proportion of businesses with a website, 58 per cent of businesses in the European Union have them. As in the case of Internet access, the prevalence of websites is higher the larger the enterprise: 53 per cent of small companies, 76 per cent of medium-sized companies and 89 per cent of large companies. Among developing countries reporting data, proportions of businesses with Internet that have a website are generally lower, ranging between 12 per cent (Colombia) and 57.6 per cent (Trinidad and Tobago). Where disaggregated data are available, aside from the presence of websites according to size of companies, the presence of websites can vary significantly among industrial classifications and can affect the weighted total.

E-commerce

19. E-commerce continues to grow in most countries, although exact data on the value of transactions are not easy to obtain. In the United States, the largest global e-commerce market, sales continued to grow in 2003. E-commerce is most prominent in manufacturing shipments, followed by wholesale trade (accounting for 21.1 and 13.1 per cent of total sales,

[4] Twenty-three countries were surveyed in 2004 and 39 in 2005. This resulted in limited comparable data for 10 countries in 2004 and for 19 countries in 2005. See the IER 05 and the website: http://measuring-ict.unctad.org/ for further details on UNCTAD's work on the measurement of ICT.

respectively). Online sales are less common in retail trade (B2C) or in services' industries, with sales accounting for only 1.7 and 1 per cent of total sales, respectively. However, with a growth rate significantly higher than for total retail trade, the share of e-commerce in total retail trade is also growing. The latest available figures (2005) indicate that its share has more than doubled since 2000. In Canada, Internet sales continued to increase substantially reaching $22.9 million in 2004. Seventy-five per cent of Internet sales is B2B, mainly between large firms. As far as industries are concerned, one quarter of all Internet sales took place in the wholesale trade sector, followed by transportation and warehousing (17 per cent).

20. Elsewhere, available information on the value of e-commerce is fragmentary, although there appears to be clear growth. Eurostat data indicate that sales over the Internet in the EU increased from 0.9 per cent of total sales in 2002 to 2.2 per cent in 2004. When online sales using other networks (in particular EDI) are added, the value increases from 6.2 to 7.7 per cent over the same period. Partial data also indicate that the percentage of enterprises' total turnover from e-commerce increased from 5.9 per cent in 2003 to 9.4 per cent in 2004.

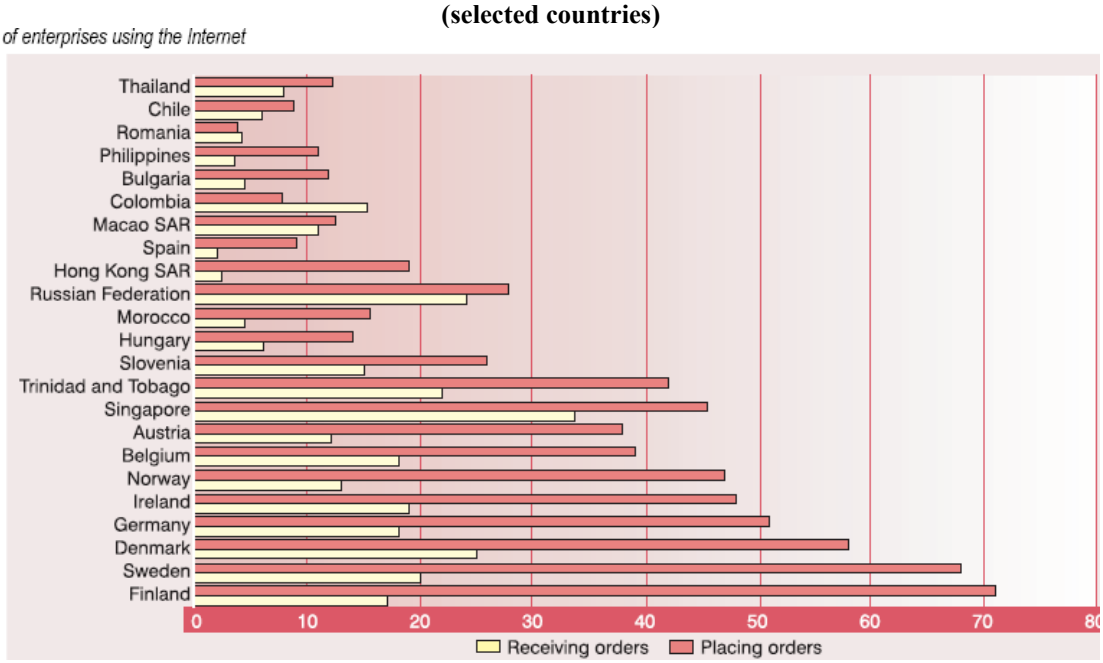
21. In the case of developing countries, information on the value of e-commerce is virtually non-existent, as well as measures of the share of e-commerce in the turnover of enterprises.[5] Only some developing countries covered by the UNCTAD survey were able to provide information on businesses receiving orders over the Internet. In general, countries reported fewer orders being received online than placed.

22. Eurostat data show that the proportion of EU enterprises selling online increases with the size of the company: 29 per cent of large enterprises placed orders as compared with 19 per cent of medium-sized enterprises and 12 per cent of small enterprises. Among non-European OECD countries, Japan reported in 2002 the largest percentage of businesses receiving orders over the Internet (18 per cent), although this refers only to enterprises with 100 or more employees, while Australia reported 13 per cent in the same year. Chart 1 illustrates the proportion of enterprises placing and receiving orders over the Internet in selected countries.

23. Regarding online purchases, 27 per cent of EU 25 enterprises reported having placed orders over the Internet in 2004, almost double the level recorded for online sales. The proportion was greater for large enterprises, 45 per cent of which reported online purchases. This is confirmed by data from selected OECD countries, which report a much larger proportion of businesses purchasing products and placing orders online than there were selling or receiving orders. The developing countries that reported the largest proportions of online purchases (of businesses with Internet) were Singapore (45.5 per cent), Trinidad and Tobago (42.0 per cent) and the Republic of Korea (25.5 per cent).

[5] Because of the difficulties in gathering data on the value of e-commerce even in developed countries, these data are not currently included in the core list of indicators nor are they requested of countries in the UNCTAD survey.

Chart 1. Enterprises placing and receiving orders over the Internet, 2004 or latest available year (selected countries)



Source: Eurostat database, 2005; UNCTAD e-business database, 2005.

Other e-business

24. As regards other e-business, there is limited information on the use of ICT by enterprises for internal business processes, and on the use of the Internet by type of activity. Data from developing countries are particularly more difficult to obtain. Few countries collect data specifically on the use of the Internet. Among those that do, e-mail is the most common type of Internet activity, followed by information search (about goods and services, the market, government and public authorities) and other research.

25. In developed countries e-banking and other financial services represent an important aspect of e-business applications. In the EU 25, 68 per cent of enterprises used the Internet for financial services in 2004. A selected number of OECD countries had a very high proportion of firms using the Internet for banking and financial services, from 45 per cent in Cyprus to 87 per cent in Slovenia. Almost none of the developing economies covered by the UNCTAD survey reported the use of the Internet for these purposes, with the exceptions of Hong Kong SAR (34.1 per cent) and Thailand (5.6 per cent).

26. Transacting with public authorities over the Internet is still not widespread, although enterprises do so more than individuals, and the level of interactivity is only growing slowly. In 2004, only 18 per cent of enterprises in the EU 25 with Internet access used it for full electronic case handling with governments. However, 51 per cent of enterprises with Internet access used the Internet to obtain information from public authorities, 46 per cent for obtaining forms and 32 per cent for returning filled-in forms. The countries covered by the UNCTAD survey have not provided much information on businesses using the Internet to transact with government or public authorities, despite the increase in e-government initiatives.

Other ICT use indicators

27. The proportion of businesses with an intranet is also a core indicator owing to the importance of such networks in e-business. Intranets help organizations work more efficiently, particularly in terms of internal communication, coordination and sharing of knowledge. In 2004, 33 per cent of businesses in EU countries with more than 10 employees used an intranet. Among those covered by the UNCTAD survey the use of intranets is comparable to European numbers: Singapore, (64.3 per cent of enterprises use an intranet), Madagascar (38.2 per cent) and the Republic of Korea (35.2 per cent).

28. The use of an extranet is less common, perhaps because of a combination of security concerns and the technical challenge of expanding the functionalities of the system to allow for external interaction. Extranets also entail changes in business processes and structures, since resources are required for maintaining and following up on this additional avenue for interaction with clients, suppliers and the general public. Such an indicator provides information on the level of e-business sophistication and interactivity in countries. In particular, more in-depth analysis of this indicator could help assess the relative importance of B2B extranets for enterprise productivity. In 2004, only 12 per cent of businesses in EU countries had extranets, with Belgium also reporting the highest proportion (23 per cent). Among developing countries, this indicator is collected less frequently than that on intranets, and in those cases where data are available the proportion of businesses with extranets is also lower than the proportion of businesses with intranets. Singapore reported the highest proportion with 27.4 per cent.

C. Measuring ICT for development

29. The limited availability of internationally comparable data on ICT, in particular on the use and impact of ICT in developing countries, severely restricts an empirical analysis of the trends and impact of ICT. At the same time, as ICT become key elements of national development strategies, policymakers have an increasing need for reliable data and indicators on the information society. Such data contributes to the formulation of strategies for ICT-driven growth and help to monitor and evaluate economic and social developments related to ICT. They also help companies take informed business and investment decisions. For the international community, e-measurement is necessary in order to document the impact of the information society on the implementation of internationally agreed development goals and measuring progress in the use of ICT to achieve those goals.

30. The absence of comparable data on ICT in developing countries has prompted a number of stakeholders at national, regional and international levels to take action. At the national level, an increasing number of statistical offices have started to incorporate basic questions on ICT into their national data collections or have carried out new ICT-specific surveys. At the regional and international levels, several organizations involved in ICT-related research, policymaking and e-measurement have begun to coordinate their activities in order to achieve global harmonization of ICT indicators.

31. Launched at UNCTAD XI, the global Partnership on Measuring ICT for Development is now widely recognized as playing a leading role in this process.[6] The Partnership provides a framework for coordinating work in information society measurements and for developing a coherent approach to advancing the development of ICT indicators globally, particularly in the developing countries. National statistics offices (NSOs) in statistically advanced countries are invited to contribute to the Partnership's activities and provide expertise and advice to NSOs in developing countries, as well as to transfer knowledge in areas such as methodologies and survey programmes. The Partnership has three main objectives: (1) to develop a common set of core ICT indicators, harmonized and agreed upon internationally; (2) to enhance the capacities of NSOs in developing countries to develop their compilation of statistics on the information society on the basis of such indicators; and (3) to develop a global database on ICT indicators and make it available on the Internet.

32. Following a global stocktaking exercise to examine the availability of official information society statistics and indicators in all countries,[7] and through an extensive process of consultation and coordination at the regional level, a core list of ICT indicators that could be collected by all countries has been developed. The list covers four broad areas of measurement: basic ICT infrastructure and access, ICT access and use by households, ICT use by businesses and the ICT sector and trade in ICT goods.[8] Through the same process proposals for capacity building in the field of ICT statistics were formulated and the need to formalize the link between ICT and the development agenda, notably regarding measurement of the achievement of the internationally agreed development goals was identified.

33. Building capacity for the production of comparable statistical indicators should contribute to the follow-up and implementation of the WSIS Geneva Plan of Action and to monitoring progress in bridging the digital divide. As this could represent an important contribution to the implementation of the outcome of WSIS, this matter will be referred to again in the conclusion of this note.

III. ENHANCING ACCESS TO ICT: THE ISSUE OF INTERNET CONNECTIVITY COSTS

34. The cost of connectivity is one the major factors limiting the extent to which enterprises, particularly those of developing countries, incorporate ICT into their business processes. For example in the survey on ICT use covering over 450 enterprises in five developing countries that was published in UNCTAD's *E-commerce and Development Report 2004*, the high cost of connecting to the Internet was the most frequently mentioned barrier to the use of ICT.

35. Among the many determinants of the cost of Internet connectivity, the high costs that Internet service providers (ISPs) in developing countries often face for their access to global Internet backbone networks are a cause for concern. Thus, paragraph 50 of the Tunis Agenda for the Information Society, the outcome document of the second phase of WSIS,

[6] Current partners include Eurostat, ITU, OECD, UNCTAD, UNESCO's Institute for Statistics, four UN Regional Commissions (ECA, ECLAC, ESCAP, ESCWA), the UN ICT Task Force and the World Bank.
[7] Stocktaking results are in the publication *Measuring ICT: The Global Status of ICT Indicators*, available at http://measuring-ict.unctad.org.
[8] See the publication "Core ICT Indicators" available at http://measuring-ict.unctad.org.

highlights the need for a better balance in international Internet connectivity charges and calls for strategies for increasing affordable global connectivity.

36. At the centre of the issue of interconnection charges is that while the costs of calls terminated in each other's network are traditionally shared in the international telephony interconnection operators, Internet operators in developing countries are often obliged to pay the full cost of the connection between their networks and those of global network service providers (NSPs), regardless of the direction of traffic. In other words, ISPs from developing countries pay for the outgoing Internet traffic originated in their networks, as well as for the incoming traffic that is destined to them.

37. This fact, in itself, cannot be taken as definitive evidence of the presence of anti-competitive practices in the market for international Internet connectivity. The decision to choose transit (purchase) over peering (barter) as the modality in which Internet traffic is exchanged most frequently reflects the similarity or disparity that exists between the cost structures of the various players involved. Networks of different sizes face different incentives to interconnect: they are much more significant for smaller networks, and a refusal to peer by the larger ones would not necessarily constitute anti-competitive behaviour. Indeed, there is little evidence of serious anti-competitive practices that would warrant *ex ante* market regulation, at least not in the main markets for interconnection services.

38. In the case of smaller developing country markets, or when countries are geographically distant from major traffic routes, market failure in Internet interconnection can indeed be an issue and intervention may be necessary. Even in the case of other developing markets, it is important that vigilance be exercised so that market structures do no evolve in a direction in which powerful market players can engage in anti-competitive behaviour. Cooperation between regulators in developed and developing countries can play a useful role in the promotion of greater transparency in the dealings between large backbone operators and developing country ISP. A useful measure could be to require large NSPs to make public the criteria they apply in their decisions to exchange traffic with other operators on a peering or transit basis. Also, greater transparency concerning the prices applicable to Internet interconnection should be encouraged, particularly with regard to the dealings between large NSPs and ISPs from developing countries. Information about the quality of the service provided, which can also be use as an anti-competitive weapon should also be more transparent. Finally, it may be useful to identify appropriate grievance redress procedures that developing country ISPs could use in response to potential anti-competitive behaviour in the market for Internet backbone connectivity.

39. In addressing the problems of the high cost of connectivity in developing countries it is important to bear in mind that international backbone connectivity represents only a small part of the total costs of ISPs, while costs determined at the domestic level are normally more significant. The experience of several developing countries indicates that if restrictions on the provision of Internet backbone services are lifted, connectivity costs can be cut and infrastructure deployment accelerated. Restrictions on the provision of international connectivity (such as forcing ISPs to use the international gateway of the incumbent operator) have also been found to represent a heavy burden for ISPs.

40. Other restrictions in domestic Internet markets often make it difficult for ISPs in developing countries to lower their costs. For example, when ISPs are allowed to create

national or regional Internet exchange points (IXPs), they can aggregate traffic, and this makes interconnection a more attractive proposition for global backbone networks. Thus, transit arrangements can be negotiated on better terms and there are more possibilities for peering. However, monopolies or dominant operators often oppose the creation of IXPs. In other cases, they impose high prices on leased lines, and these prices may represent up to 70 per cent of the total cost of ISPs.

41. Enabling ISPs in developing countries to make their own choices about the commercial modalities that are best suited to their connectivity needs would result in an acceleration of the deployment of the Internet in those countries. Some ISPs may prefer to buy transit services from regional or global networks. Others may decide to aggregate traffic with other operators and thus gain leverage in their dealings with global providers. Others still may choose to build or buy their own end-to-end capacity.

42. Concerns remain, however, about those developing countries, particularly among the least developed countries, that have very limited access to international backbone networks. For reasons both of the small size of their markets and geographical difficulties, it is unrealistic to expect that domestic liberalization will be enough to bring down the cost of Internet interconnection to levels that enable a significant improvement in Internet affordability. International cooperation has therefore an important role to play in accompanying and supporting the commercial development of Internet connectivity in these countries.

43. The creation of IXPs should be supported. Where they already exist, their operation at the national level should be facilitated and cooperation agreements at the regional level should be promoted.

44. Equally important is to establish a competitive environment for ISPs. Particular attention should be paid to ISP domestic interconnection. New entrants should have guaranteed interconnection with other operators, particularly with the incumbent one, quickly and at a reasonable cost. ISPs would benefit from more competitive conditions for the purchase of international leased circuit capacity. Another area of concern is ISP licensing, which is subject to very high fees in many developing countries. Finally, ISPs may benefit from capacity-building efforts to help them better understand the full range of international connectivity options open to them.

45. Very Small Aperture Terminal (VSAT) satellites may increase the availability of bandwidth and reduce its cost. However, in many developing countries regulatory restrictions are inhibiting their deployment. The development of policy consensus among developing countries at the regional level might facilitate their diffusion by creating economies of scale.

46. Finally, Internet policymaking and regulation is an area that requires levels of expertise and resources that are often scarce in developing countries. International support for capacity building in this area would therefore be useful.

47. If abuses of dominant positions are prevented through enhanced transparency and international regulatory cooperation, Internet operators should face the right set of incentives to invest in infrastructure and increase connectivity in developing countries. Policies to promote Internet take-up by households, businesses and public entities by generating a

critical mass of Internet users may provide one of the most effective instruments to address the issue of Internet backbone interconnection costs.

IV. SELECTED E-BUSINESS APPLICATIONS: INTERNATIONAL AND DEVELOPMENT DIMENSIONS

48. This section deals with three related aspects of e-business that are fundamental for ICT-supported economic growth and development: Internet security and risk management; the treatment of illicit Internet activity; and information asymmetry in developing economies.

Internet security and risk management

49. E-business cannot develop without trust in ICT. Estimates of economic damage caused by security breaches vary but certainly reach into the tens, if not hundreds, of billions of dollars per year. The threat of such losses may, in turn, deter the application of information technologies where they may bring about valuable gains for development. Investment in security technologies is currently at a less than optimal level and governments in developed and developing countries are increasingly feeling the need to address information security issues.

50. A risk management approach can make significant contributions to defining and implementing government policies in this area. Risk management entails moving away from a technology-centred treatment of information security towards adopting a more holistic approach. Instead of reacting to security attacks with technical solutions, risk management encompasses both the problem and its context; this approach includes analysing the balance of incentives and, in particular from a government policy perspective, the structure of the information security and technology market.

51. The most immediate and, at the same time, most difficult task is to conduct an evaluation of the information assets at risk, followed by an assessment of the various threats that affect these assets, their frequency and the severity of the damage these threats may inflict. Risk mitigation activities and reducing the hazardous conditions under which a threat can materialize are the next step. This includes the application of security technologies, security policies, regulations, standards and information security education and training. Having put in place all feasible risk mitigation options, risk management moves towards finding ways to reduce the severity of potential loss and damage and often implies establishing safety and emergency response teams, technologies and procedures. Inevitably, any entity must accept that some damage will occur at some point and must choose to transfer some risk using insurance, thus securing a source of financial compensation for part of the loss.

52. Governments are finding that the state of information security technologies is unsatisfactory from a critical infrastructure perspective. Their actions typically fall into the risk mitigation or loss severity reduction phases of the risk management process. In practice, governments often propose regulations mandating general minimum standards or specific requirements for certain industries or government suppliers. They can also encourage self-regulation in response to consumer demands for quality certification. Governments can support the establishment of national computer emergency response teams. Finally, international policy processes for information security have been launched, initially from the

perspective of instituting a common understanding and platform on cybercrime issues, moving thereafter to establish best practice guidelines that incorporate the need to use risk management processes and techniques.

53. The position of developing countries is not conceptually different from that of developed countries. As electronic communications become part of everyday life for many people, there may be an overall decrease in risk tolerance: early adopters of ICT may be less risk-averse or more technically capable of dealing with the security consequences. Thus, the question of information security gains in strategic importance as digital penetration increases. Developing countries may, however, need to address several issues more specifically. The first is that the scope for human resource development may be greater, and government policy may reflect this by extending activities and support to all educational and training institutions. The second is that disincentives for applying information security may be greater as there is less to protect, the most valuable information assets being owned or managed by entities in developed countries. This suggests that international technical and policy cooperation with developing countries should be encouraged and supported as it can only be mutually beneficial. As export and outsourcing opportunities increasingly depend on satisfying security regulations in export destinations, undemanding domestic regulation hinders technology or the outsourcing of export development.

54. International and national regulatory and standards bodies have also taken up this issue and are now formulating and advising on minimum information security standards for international commercial partners. The substantive engagement of the international community in providing guidelines and addressing particular issues that may need policy consideration and action should offset the difficulties presented by increased regulatory requirements, provided that the latter are followed up with practical capacity-building and technical cooperation activities. The technologies that bring with them the inconvenience of increased security risks present stakeholders in the digital development process with many opportunities to share security information and experience.

Cybercrime

55. Cybercrime is the most serious threat to the development of the information economy, and is now considered to be a source of concern to the international community. Cybercrime may target the data being processed by systems, or the integrity, confidentiality and availability of the systems themselves. Where such attacks are targeted at a country's critical national infrastructure, such as power systems or transportation networks, the consequences may be disastrous.

56. While the full economic cost of cybercrime is difficult to measure accurately, it is clear that the cost to individuals, businesses and governments is not only substantial but rising. Since they have different levels of technological development, developing countries may experience different types of threats than those experienced by developed countries.

57. Protecting systems from attacks primarily relies on the implementation of appropriate technical, physical and operational security measures. They must be complemented and supported by a legal framework that deters such threats by criminalizing these types of activities and enabling law enforcement agencies to adequately investigate and prosecute people engaging in cybercrime.

58. Legal provisions addressing cybercrime should ensure that the criminal code is capable of being applied to acts involving the use of computers, rather than involve a wholesale revision of the existing criminal code. Existing laws may need to be amended to reflect the involvement of computer and communication technologies. In addition, the penalties associated with certain crimes may need to be increased in order to address their greater prevalence in an Internet environment. Most countries also create new offences to cover criminal activities that specifically target computer and communication systems and the data they hold.

59. Another aspect of the fight against cybercrime concerns enhancing the capacity of law enforcement agencies by granting them the necessary powers, training, expertise and resources. Countries will need to consider procedural law reforms, such as laws governing search and seizure and the interception of communications, to adequately equip their law enforcement agencies to investigate cybercrime. But governments must also balance the need to tackle cybercrime with the protection of individual rights and liberties.

60. The international nature of cybercrime makes its necessary to ensure that legal protection is harmonized among nations and that cybercrime havens do not emerge. While cybercrime legislation is important, it is equally critical that States can assist one another in an investigation, even when one of them is merely the location of the intruder or a pass-through site.

61. The most significant intergovernmental undertaking in this area to date is the Convention on Cybercrime of the Council of Europe, which is open for ratification by non-European countries. Its comprehensive character and the geographical spread of its signatories mean that the Convention is likely to remain the most significant international legal instrument in the field for the foreseeable future. However, both human rights groups and providers of communication services have voiced concerns about it and calls have been made for a treaty to be drafted under the auspices of the United Nations.

E-credit information

62. While the topics of cybercrime and Internet security relates to the risks for information security that could emerge from the misuse of ICT, e-credit information addresses the question of how the use of ICT can reduce the risks generated by information asymmetries about the financial creditworthiness of SMEs, and thus enhance their access to credit and trade finance.

63. In most developing countries, financial service providers are not yet in a position to use modern credit risk management techniques to assess borrowers' risk and thus competitively provide capital, particularly trade finance, to enterprises. In the case of enterprises operating in the informal economy, the lack of a documented track record excludes them from formal financial intermediation.

64. The secretariat's findings suggest that an interesting avenue for improving developing countries' access to trade-related finance and e-finance could be the extensive use of the Internet to overcome information asymmetry between creditors and borrowers. This requires the reinforcement of their credit infrastructure (registration and bankruptcy laws,

public and court registers, accounting, reporting and disclosure standards, standards for auditors, and public data dissemination and publishing requirements). This way public credit registries and credit bureaux may be able to operate and provide adequate and up-to-date electronic credit information. This would, in its turn, allow banks and other lenders to better assess enterprise risks using modern ICT-based techniques for credit risk assessment and credit scoring.

65. Furthermore, emerging international banking capital adequacy regulations (Basel II), make the credit risks rating of potential borrowers a condition for their access to bank loans. Basel II also recommends a new, more differentiated and stricter regulatory capital criterion for various types of such ratings. This reinforces the need for the development of e-credit information and related e-credit rating and scoring techniques in the developing and transition economies.

66. The experience of e-trade finance platforms of developing countries shows that some of them have players who can compete with major providers in terms of the use of web-based technologies, which make it possible to develop e-credit information techniques, undertake e-trade finance operations and even reconcile the whole spectrum of online trade operations, including e-trade finance. However, in other cases, the ability of operators in developing countries to apply state-of-the-art technologies might be constrained by bottlenecks related to lack of access to the necessary skills and know-how. Well-targeted technical cooperation may have a role to play in this area.

67. A final consideration refers to the issues of security and trust that were explored at the beginning of this section: Even if online credit information and credit risk management systems are put in place, trading partners and their financers will not be able to benefit from the availability of modern credit information services unless exogenous risks linked to operation of IT systems are addressed. Concerns about the security of e-payments and e-finance instruments often result in a wait-and-see approach among traders and financial services providers that in the end delays the elimination of expensive, error-prone paper-based trade and trade finance.

V. CONCLUSIONS

68. The preceding sections have presented some salient features of the secretariat's more recent work on issues of e-business and development. Other ICT and e-business activities such as the implementation of the UNCTAD XI Partnerships on ICT for Development, advisory services on free and open source software, the development of e-tourism capacities in developing countries and capacity building in the area of e-measurement have not been presented in this paper. All these activities were implemented in the broader context of the WSIS process, both in the implementation of the outcome of its first phase and in the preparation for the Tunis phase of the Summit. The primary consideration in this regard was to support the treatment of the economic development dimension of the information society, in close coordination and cooperation with other relevant international agencies.

69. As the Commission conducts its policy dialogue on the issues of ICT, e-business and development, it may wish to take into account the precise match between UNCTAD's role in the field of ICT and e-business and development as designed by the São Paulo Consensus and some particular lines of action that are part of the outcome of the WSIS process. In particular,

in the Tunis Agenda for the Information Society the international community decided to attribute UNCTAD with a facilitation role in the implementation of several action lines related to capacity building, creating an enabling environment, and ICT applications in e-business and e-science. The Tunis agenda also stresses the importance of the production of appropriate indicators and benchmarking instruments to monitor and assess progress in the use of ICT to achieve internationally-agreed development goals and objectives. In this regard, the Summit reaffirmed the role of the Partnership on Measuring ICT for Development in which UNCTAD plays a central role.

70. In this context, the Commission may wish to consider aspects such as those proposed in the following paragraphs, as well as other ways in which UNCTAD could contribute to reaching international community development goals in the area of ICT:

(a) Policies and measures to enhance the availability of comparable data on ICT from developing countries; this will include the assistance to national statistical systems in the collection of ICT indicators, through appropriate capacity building activities and technical cooperation. This directly responds to the WSIS Tunis Agenda call for action to produce a periodic evaluation of the implementation of the WSIS Plan of Action, based on an agreed methodology, a major objective and contribution of the Partnership on Measuring ICT for Development.

(b) Policies to address Internet interconnection cost through the development of regional backbones and alternative methods of international Internet connectivity; means to facilitate the establishment and operation of Internet Exchange Points at the national and regional levels; policies to increase transparency and prevent discriminatory practices in Internet interconnection; and areas for capacity building to enable ISPs of developing countries to better benefit from existing alternatives in Internet interconnection.

(c) Policy experiences regarding the application of risk management to information security as a foundation of an enabling environment for ICT and e-business; the incorporation of Internet security considerations into national e-strategies for development; and the trade and development aspects of the international fight against cybercrime.

(d) Strategies and policies to facilitate the spread of e-business practices in the sectors of higher priority for developing countries, with special reference to the financing of SMEs and the development of labour-intensive sectors.

(e) Policies that support a better understanding and use of free and open source software and technologies, given their positive implications for the development of ICT-related human capacities. Special consideration should be given to the economic and cost implications of such technologies and their role in bringing ICT to underprivileged sections of the population in developing countries.

(f) Possible frameworks for reviewing ICT and e-business policies at the national level, to assess obstacles and success factors in the implementation of ICT for development strategies in developing countries.

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