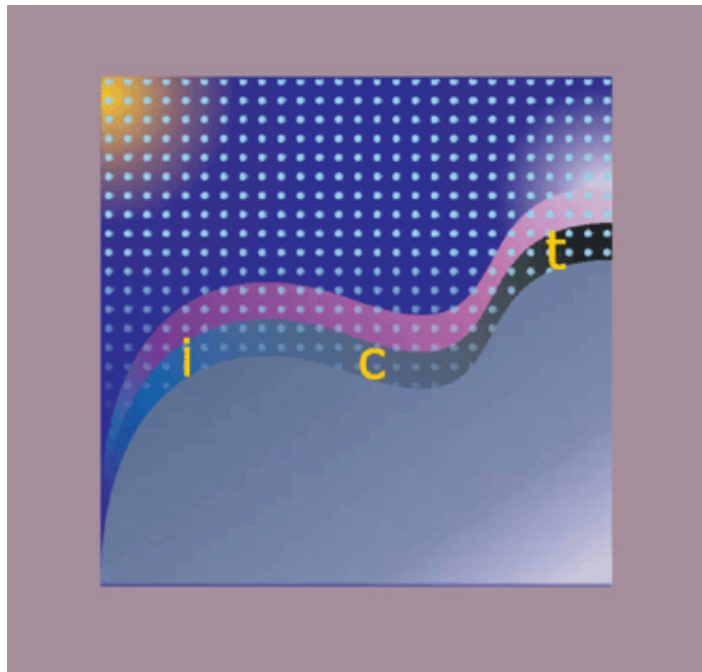


United Nations Conference on Trade and Development

E-COMMERCE AND DEVELOPMENT REPORT 2002

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Chapter 5

THE IT INDUSTRY, E- BUSINESS AND DEVELOPMENT

A. Introduction and definition of the information technology industry

This chapter looks at the information technology producing sector (IT) with special reference to IT multinationals' investments in developing countries.

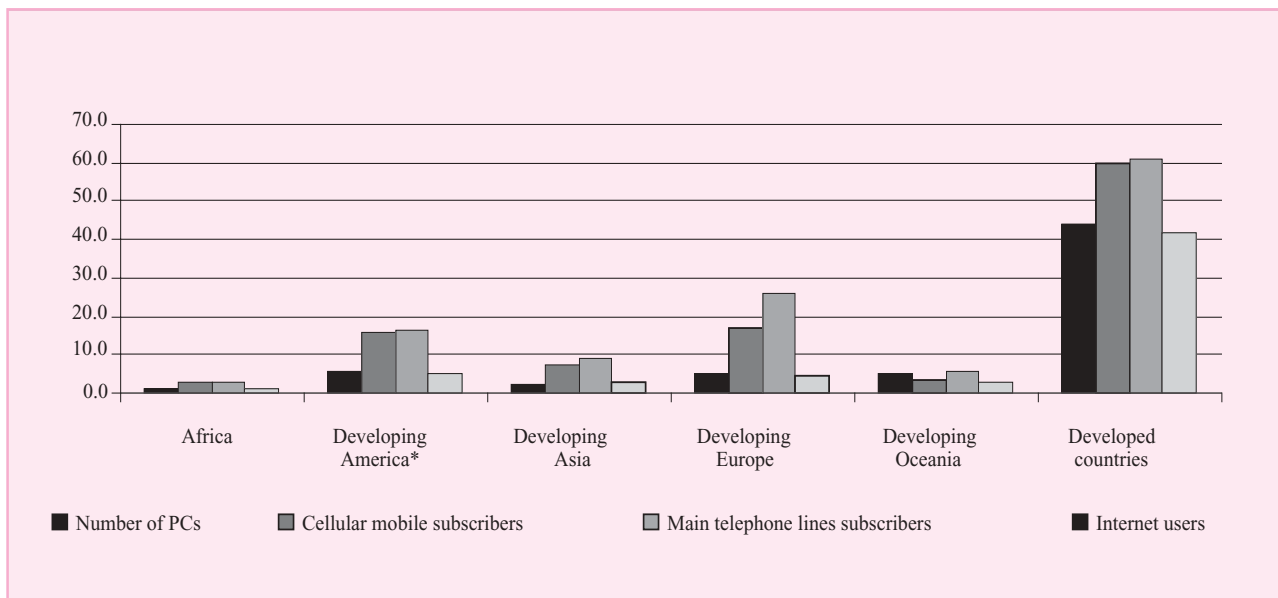
The IT industry provides essential instruments that make e-business possible, including not only computer hardware and software but also fixed telephones, mobile telephones, telecommunication equipment and wireless transmission equipment.¹ As chart 12 below

shows, the availability of IT equipment goes hand in hand with Internet connectivity and is therefore clearly a prerequisite for e-business.

Even though e-business impinges on IT goods, this does not necessarily imply that having a local IT producing industry would be an advantage for the local business sector when it moves into e-business. However, when the business sector starts adopting new information and communications technologies in its operations, it relies heavily on local or locally available IT expertise in order to fully realize all the efficiency gains that the Internet makes possible at the level of a single firm as well as at the level of the industry and of the country's economy as a whole.

Chart 12

Access to telephones, PCs and the Internet per 100 inhabitants (2001)



Source: UNCTAD calculations on ITU data.

In this connection, the existence of a local IT sector or of investment from IT multinationals might contribute to the take-off of e-business in developing countries if it promotes IT awareness and culture in the local business sector, if it advances the IT competencies of the workforce and if it brings the technology closer to the local business community.

In the light of the above, this chapter sets itself two objectives. On the one hand, it tries to present some long-term trends in the industry that produces the tools necessary for conducting 'e-business', in its widest possible meaning. On the other hand, it attempts to present evidence about whether the conditions outlined above are realized, or in other words, whether the IT industry can contribute to development and growth by enhancing a country's capacity to engage in e-business.

This chapter presents data on international trade in IT products and the trade policy environment in which the industry operates, and summarizes the debate on the impact of IT on growth and development. In addition, it presents the results of an UNCTAD survey of the most influential IT multinationals designed to obtain information about their investment in developing countries and countries with economies in transition and their use of e-commerce in general and in the latter countries in particular.

Clearly, the analysis does not aim to be exhaustive. It needs to be complemented by the analysis – contained in other chapters of this report – of the experience of companies from developing countries that are successfully engaging in the production of IT goods, as well as of the IT-using business sector that is turning the new technologies into new products and new ways of conducting business.

B. Trade in IT products and trade policy environment

Although reliable data on the IT industry are hard to find, it is safe to say that IT is one of the world's largest industries. According to one estimate, "worldwide IT spending has reached almost \$988 billion and is expected to increase at a compound annual growth rate (CAGR) of 9.4 per cent from 2001 to 2006 to reach \$1.5 trillion".²

Most analysts agree that the IT industry, having suffered a setback in 2001 due to the economic recession and the effects of the tragic events of 11 September, might experience a modest recovery in 2002. Growth should then pick up again in 2003.³

The IT sector was the subject of intense negotiations during the Uruguay Round and remains so today. In

Box 17

The Information Technology Agreement

The products covered by the Agreement include computers and other electronic data processing equipment, semiconductors, telecommunications equipment, and computer software¹.

For these products, participating Governments agreed to completely phase out tariffs and all other duties and charges by 1 January 2000. However, developing countries participating in the agreement however, have requested and received an extended phase-out period for at least some products. In no case does the implementation period extend beyond the year 2005.

As of 4 February 2002, 57 Members States or separate customs territories in the process of acceding to the WTO had signed the ITA. Collectively, they represented approximately 93 per cent of world trade in IT products.

In addition to the elimination of tariffs on the products that were initially covered, the ITA called on participating Governments to expand product coverage. To date, however, in spite of the intense negotiations in the Committee of Participants on the Expansion of Trade in Information Technology Products, which supervises the implementation of the Agreement, no products have been added to the initial lists. The Committee is also negotiating the question of non-tariff barriers with a view to including these within the scope of the Agreement.

¹ The complete listing of the products covered by the Agreement can be downloaded from WTO (1996).

December 1996, at the first WTO Ministerial Conference held in Singapore 54 WTO Member States signed the Information Technology Agreement (ITA – see box 17 for details). Its two most important characteristics are that:

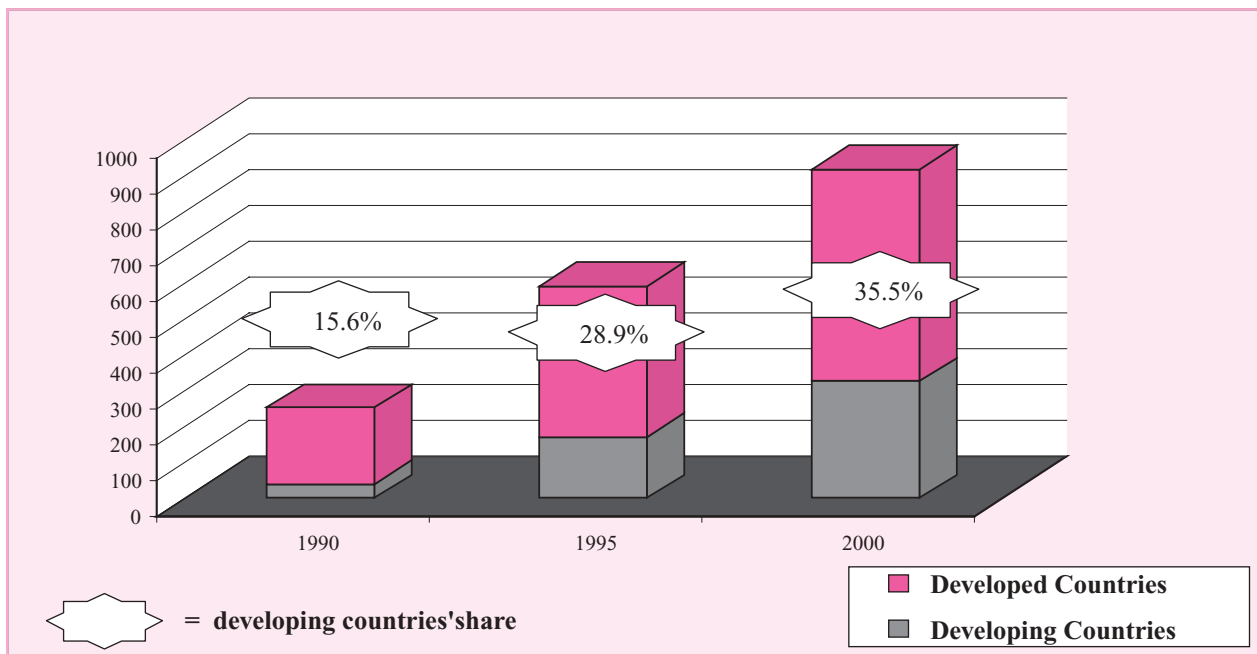
- It was signed as a separate document, and is therefore not a part of the “Single Undertaking”: for this reason, participation in the Agreement is not compulsory for WTO member countries and for countries that are in the process of accession to the WTO;
- It is a tariff-cutting mechanism that obliges its members to cut tariffs of all products covered to zero.

As shown in chart 13, trade in IT products grew tremendously over the last decade and was worth over \$ 900 billion in 2000.⁴ In particular, exports of IT products from developing countries grew at a compound annual growth rate (CAGR) of 23.5 per cent over the

last decade, while exports from developed countries grew at a CAGR of 10.8 per cent.⁵ By comparison, total world exports grew by 6 per cent over the same period.⁶ As a consequence, the share of developing countries and economies in transition in IT exports grew from 15.6 per cent of exports in 1990 to 35.5 per cent in 2000.

It is also worth noting that IT exports represent a higher share in the exports of developing countries than in those of developed countries. In fact, IT exports grew from 12 per cent of total developing countries’ exports in 1990 to 22 per cent of their total exports in 2000, while for developed countries the share was respectively 10 per cent in 1990 and 14 per cent in 2000.⁷ This phenomenon was a result of transnational corporations strategies for locating hardware production in emerging markets, as well as of developing countries’ efforts to develop local IT production capacities which resulted in important outsourcing of IT production to those countries.

Chart 13
Total exports of IT products (\$billions)

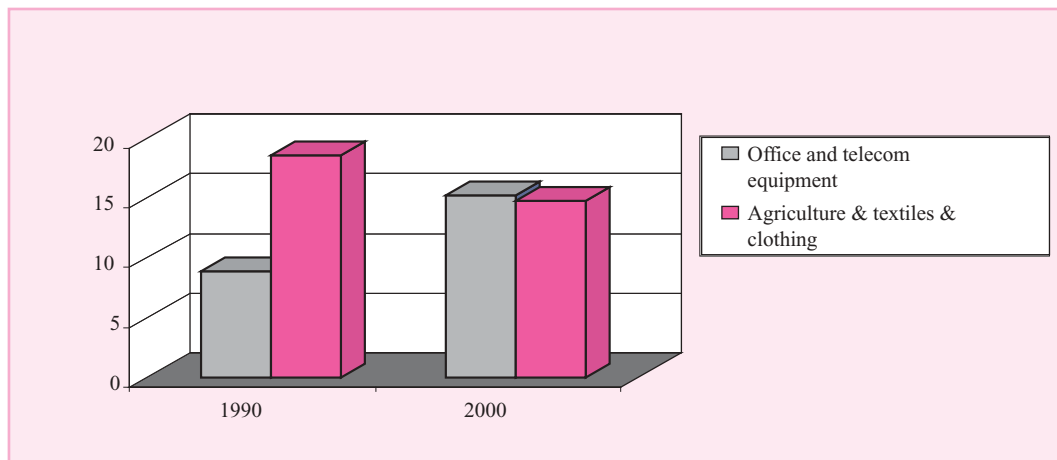


Source: UNCTAD COMTRADE database.

As a result of the rapid growth in the last decade, and as shown in chart 14, the share of IT products now

exceeds the share of agriculture, textiles and clothing products combined.

Chart 14
Share of IT in World Trade (percentage)



Source: WTO (2002).

The main sub-sectors within the IT industry were semiconductors, electronic data processing (EDP), office equipment (OE), telecommunications equipment, components and miscellaneous goods.⁸ The two largest of these – accounting for almost 60 per cent of IT exports – were EDP and semiconductors.⁹

EDP was the largest sub-sector, with 29 per cent of total IT exports in 2000.¹⁰ This segment includes personal computers, mainframe computers and peripherals such as keyboards, printers, monitors, cables and modems. Storage units, for example hard drives but also CDs and diskettes, are also included in this category. It is interesting to note that trade in EDP includes trade in packaged software, although this is not specifically mentioned. This happens for two sets of reasons: on the one hand, a large proportion of internationally traded software is installed in new computer devices, and users pay for it as part of the price of their new machine; this makes the distinction between hardware and software difficult to capture in import and export figures. This problem is compounded by the fact that, in the current trade nomenclature, there is no distinction between virgin disks and disks containing data, information or programs, so that even software that is sold separately from new computers is not adequately recorded in international trade figures.

The share of developing countries in EDP hardware was quite high, accounting for 40 per cent of exports in 2000.¹¹ Developed countries – and in particular the

United States and Japan – are the main producers of high-end computer products, but Asian countries, particularly Singapore, the Republic of Korea, Malaysia, Thailand and China, are also powerful competitors, especially in the PC sub-segment.¹² Thus, the presence of developing countries is higher in the commoditized IT products, which are characterized by low value-added.

As regards software, the United States is the world's leading exporter, and it has been estimated that 'American off-the-shelf software accounts for 70 per cent of the world market'.¹³ Among developed countries, Japan, Ireland, Singapore, the United Kingdom, France and the Netherlands are emerging as software industry hubs. Among the developing countries, a number of Asian countries are promoting production of software and software services, in particular India, Pakistan, Malaysia, the Philippines and Thailand, among others.¹⁴

The second largest sub-sector, with 25 per cent of exports, was semiconductors, and it was the one with the largest participation by developing countries, accounting for 43 per cent of exports.¹⁵ Again, the largest producers were the United States and Japan, together with a number of ASEAN countries, whose market share has been increasing steadily. Leading exporters from the ASEAN region are in particular the Republic of Korea, Thailand and Taiwan Province of China.¹⁶

Table 19
Total exports of IT products and developing countries' share of exports

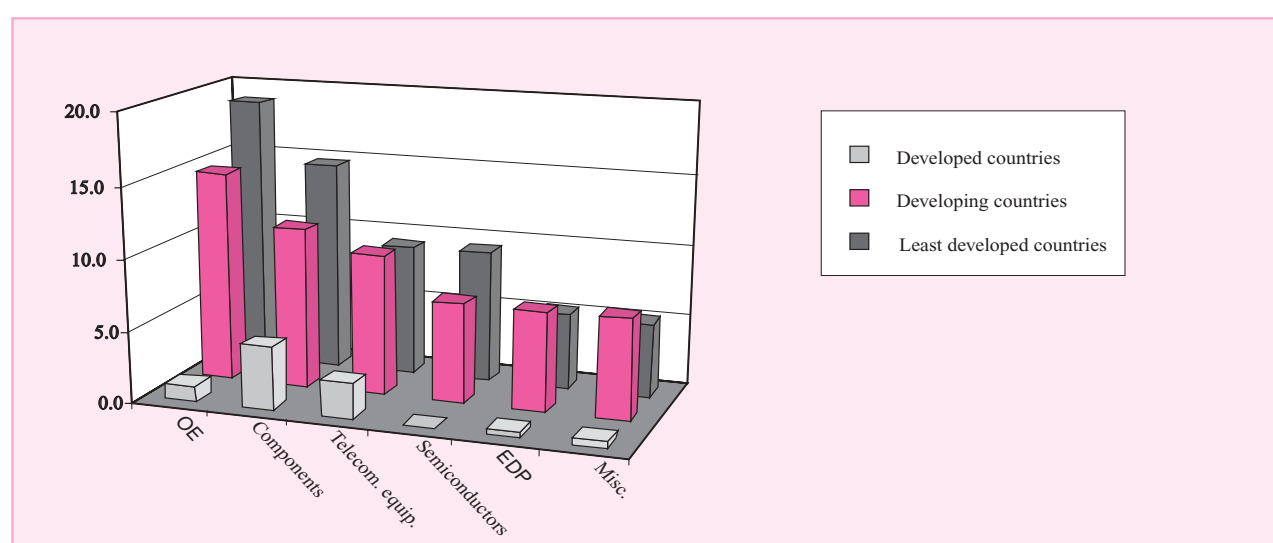
Years	1990		1995		2000	
Product Group	Total exports (billion \$)	Developing Countries' Share (%)	Total exports (billion \$)	Developing Countries' Share (%)	Total exports (billion \$)	Developing Countries' Share (%)
Electronic Data Processing	94	15	196	28	303	40
Semiconductors	41	29	138	38	227	43
Other components	51	14	125	27	179	34
Telecommunications equipment	16	11	42	16	109	24
Miscellaneous	26	4	56	20	60	13
Office equipment	25	16	37	36	41	34
Total	253	16	594	29	919	36

Source: UNCTAD COMTRADE database.

As shown in chart 15, the level of tariff protection applied to IT goods is currently low in developed countries and it is quite likely that since developed countries are the main markets for these products, this was one of the factors that enabled the rapid growth of developing countries' exports of IT goods. However, tariffs remain relatively high in the developing world and especially so in least developed countries. As the chart shows, the level of protection is highest in the office equipment and components sub-sectors. The reason for this, with regard to the components sub-sector, is in part that some products included in that sub-sector are difficult to separate from compo-

nents of an electrical and even mechanical nature.¹⁷ Thus, these products were not subject to the sweeping tariff-cutting exercise that focused on the IT sector. Even when this is taken into account, the rate applied by some of the least developed countries appears to represent one more obstacle for companies located in those countries in accessing technology at reasonable cost. In order to enable developing countries' manufacturers and service providers to engage in e-business and to take full advantage of the opportunities offered by the new technologies, the tariffs levied on these products need to be reassessed.

Chart 15
Simple average of tariffs applied to IT products



Source: UNCTAD TRAINS database.

C. Role of IT in e-business and the developmental impact of the IT industry

In the last three decades a number of countries have used the IT industry as a tool for their development, for a number of reasons. First, the sheer size of the industry now makes it an important investment opportunity. Second, since many segments of the industry do not require a large amount of upfront capital, entry in this sector is relatively easy for countries that have adequate human capital. Third, as mentioned in the previous section, the protection level for the IT industry is relatively low in the major importing markets, and this no doubt was among the factors that favoured the growth of the IT industry in some of the developing countries.

A number of developing countries have therefore undertaken strategies to attract investment in the field

of IT and/or develop the IT industry. The IT industry has grown in waves, as regards both technological developments and market demand, so according to one interpretation, the countries that have succeeded in developing an IT local sector were those that recognized and consequently targeted an emerging trend, investing in the production of goods for which the technology was already established, but for which the market was not yet saturated.¹⁸ Some of the South-East Asian countries were, for example, successful in penetrating the PC industry in the early 1980's when PCs relied on a robust technological base and the industry was growing fast.

One clearly emerging new wave in the next few years concerns the development of open-source software. As explained in box 18, open-source not only offers promising opportunities to the software industry in developing countries but also is particularly well adapted to fitting in with developing countries' current pattern of hardware production.

Box 18

Open-source software

In contrast to the proprietary software produced by most commercial manufacturers, open-source software is written and perfected by volunteers, who freely share the programming code that would otherwise be kept secret. Under the terms of the most popular open-source licences, anyone can redistribute the software without paying fees to its author, and anyone can modify it if they distribute the new version under the original terms: open-source and non-proprietary.

The most important of open-source products is the operating system Linux, which has become a powerful competitor of proprietary software and is running on 30 per cent of all active website servers on the Internet, including perhaps the most famous B2C website, Amazon.com. Furthermore, it was recently reported that 'Merrill Lynch and Credit Suisse First Boston have both started to use Linux throughout their operations, for such high-powered tasks as financial trading and order processing'.²

The development of open-source software provides promising opportunities for the software industry in developing countries. In this respect, it should be made clear that open-source is free in the sense that anyone is free to view and modify its source code, but not in the sense that nobody is selling it. For-profit companies have found ways to sell open-source software basically by selling customer service and support.

It is also interesting that the development of open-source provides an ideal match for the capacities of developing countries also as regards their current patterns of hardware production. In fact, thanks to open-source programs, complex applications can run on ordinary PCs linked together into "farms" rather than requiring more expensive super-computers and mainframe workstations. Because ordinary PCs are mainly produced in developing countries, while more expensive equipment is mostly produced in the developed countries, the developing countries can capitalize on their strength by developing open-source software.

In addition, by writing applications based on the Linux operating system, programmers from developing countries will be increasingly be able to acquire a more direct understanding of the operating system and enhance their skills. Also, developing countries' programmers can now draw on the online collaboration by software engineers throughout the world in the development of the software and benefit from shared experience rather than from the mere transfer of a technology that is developed outside their borders.

Box 18 (continued)

An interesting example of the utilization of Linux in the developing countries comes from a Pakistani university and research institution,³ where low-cost, old computers – such as 386 or 486 machines with no hard disk and little memory – are used in connection with larger machines to operate a laboratory which is used to give courses in engineering and computer programming.

¹ See www.netcraft.com/survey.

² Dylan Tweney (2002).

³ The University of Engineering and Technology, Lahore, Pakistan. For details see Bokhari, and Rehman (1999).

Another emerging trend in developing countries is the customization of IT and especially software products for the use of their local or regional markets. In fact, a number of SMEs from developing countries are

closely cooperating with transnational corporations in order to make their products or services suitable for the particular needs of a niche clientele or a foreign market. Box 19 explores this area and gives examples.

Box 19

Localization of software and websites: a growing industry

The increasing size and reach of the IT industry and the Internet have created the need for the “localization” of software packages as well as of companies’ websites. Localization can simply mean translation of the content into the local language, but quite often goes further because the software programs will require some re-engineering in order to run smoothly in the foreign language environment.

For example, there is a major need to “Arabize” software for the Middle East region, a potentially large market with some 175 million Arabic speakers, Arabic being the sixth most widely spoken language in the world. A number of Egyptian companies are competing in this potentially lucrative market, in the hope they can replicate the success that they enjoy in the Arab world in producing media content – books, films and broadcasting. Examples include Shazly, specializing in the Arabization of English software, (<http://www.shazly.8m.com>) and S.A.L.T. (<http://www.salty2k.com> Systems Arabic Localization Technology), which has conducted successful localization of Microsoft and Lotus software packages as well as providing services related to websites translation and web hosting. From another region, Transco Technology Co., Ltd. of China (<http://www.transco.com.cn>) provides an already solid client base of TNCs with localization in respect of the growing Chinese market.

Interestingly, localization is clearly also extremely important in the open-source environment. As an example, Arabeyes (www.arabeyes.com) is “a Meta project that is aimed at fully supporting the Arabic language in the Unix/Linux environment. It is designed to be a central location to standardize the Arabization process. Arabeyes relies on voluntary contributions by computer professionals” from all over the world. As was discussed above, open-source provides a number of opportunities for developing countries: these opportunities can only be enhanced by localization and translation into local languages, which can then serve as a springboard for developing new ventures and business opportunities.

A number of other examples could be given of potential opportunities for companies from developing countries in the IT sector. However, it is more important to underline the key input that IT makes to development in its widest possible sense. In fact, IT is among the factors that underpin the globalization taking place in virtually all business sectors.

New ICT such as the Internet give companies the opportunity to develop new products, to access world

markets at lower costs and to source the goods and services needed in the production process in wider and more competitive markets. This translates into increased efficiency not only at the level of the firm, but also at the level of the business sector and the economy as a whole.¹⁹

While it is clear that many companies in developing and transition economies are using e-business in a variety of forms,²⁰ to fully benefit from the new tech-

nologies and integrate them into everyday business requires a technological infrastructure and a level of workforce expertise that are beyond the reach of the majority of small and medium sized enterprises in developing countries. It is for this reason that business associations, local and national governments, and international organizations are developing a number of initiatives in order to create a nurturing environment into which the business community can successfully integrate e-business practices.²¹

The present analysis is complementary to these efforts, in that its aim is to offer hindsight on the role of the IT industry in facilitating the adoption of e-business by the local business sector in developing countries. In this connection, the next paragraph presents the survey designed and conducted by the UNCTAD secretariat in order to highlight some of the basic facts of foreign investment in IT in developing countries and especially the relationship between IT transnational corporations and the local workforce and the local business sector.

D. Methodology of the survey of the most important IT multinationals

The UNCTAD secretariat undertook a survey of the determinants of IT companies' investment and use of e-commerce in developing and transition economies. It used several databases²² in order to identify all the IT companies of a size large enough to justify overseas investment. Information about the sample population, the rate of response and a copy of the questionnaire can be found in annex 2.

The questions included in the questionnaire were carefully selected and worded in such a way as to minimize the work required of the respondents and to facilitate the analysis of the results. This meant that – with only one exception – multiple-choice questions were preferred to open questions. As an example, many of the questions requested the respondents to choose among alternative strategic options or rank various factors that guide their investment decisions or desired government strategies. Of course, this implied a certain loss of spontaneity and of generality in the answers, which are typical and have to be accepted in these surveys.

While a question on the magnitude of worldwide revenue from IT products was included, questions aimed at extracting quantitative information such as the mag-

nitude of planned or existing investment, the revenues from sales at a specific location or the number of personnel working in any given site were deliberately excluded for a number of reasons. First, quantitative information would be difficult for the companies to disclose, and would prevent many from participating in the survey and providing a valuable insight into policies and strategic business options. Second, these questions would not necessarily have given indications about the magnitude of developing country operations. For example, depending on the different ownership arrangements and on the business strategy adopted by the mother company or by the local management, a very small upfront investment could result in a larger or a smaller business venture. Including a question on the number of employees could have been equally misleading, depending on what part of the work was subcontracted and on the labour or capital intensity of the goods that were produced (production of semiconductors is capital-intensive whereas IT services are markedly labour-intensive).

The answers, which are presented below, are intended to be of assistance in the design of policies and strategies that will not only attract the kind of IT investment that best matches a country's strengths but also allow developing countries and countries in transition to increase the IT competence of the workforce and to deepen the linkages between national firms and IT multinationals. Unless otherwise indicated, the source of all the data presented in the next paragraphs is the UNCTAD survey.

E. Results of the survey

1. Composition of the sample

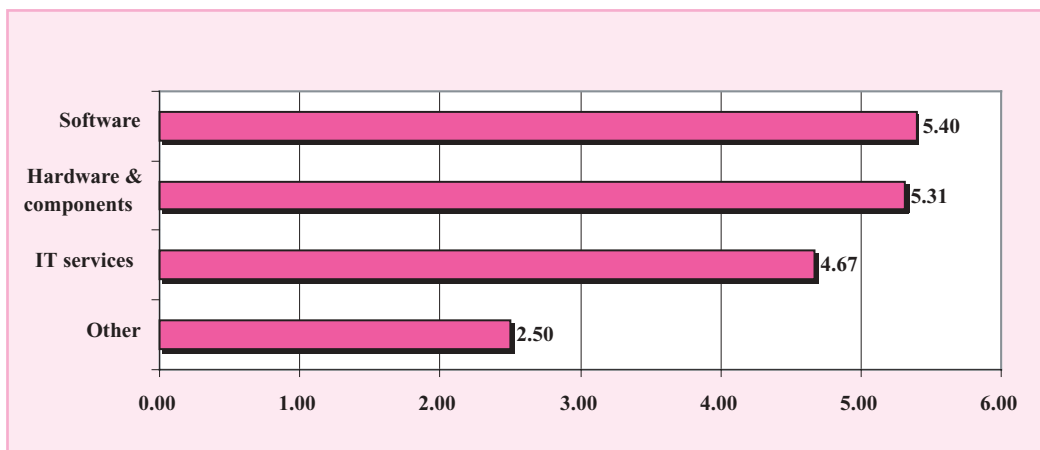
As regards the composition of the sample of respondents, the 35 companies that replied to the questionnaire had a cumulative turnover from IT products of \$ 413 billion, which represents around a half of IT worldwide production. The average turnover was \$ 12 billion: it should be noted however that this is not the total turnover of the companies – which is even larger – but exclusively the revenue from IT sales.

The sample included companies of different sizes and revealed that even relatively small-scale companies in the field of IT invest in overseas markets. Twelve companies had a turnover of less than \$ 1 billion, nine companies between \$ 1 and 10 billion, five companies between \$ 10 and 20 billion, five between \$ 20 and 40 billion, and 3 with more than \$ 40 billion.

The survey was not addressed to local IT-producing companies in developing countries for two sets of reasons. First, multinational companies make up an important share of production in the IT sector. For instance, the sum of the revenue of the top ten hardware and of the top ten software producers, according to *Fortune magazine*, is \$ 311 billion, or roughly a third of worldwide IT spending.²³ Secondly, it would have required two different questionnaires to inquire about the local operations of small IT companies and the overseas operations of IT multinationals, so that it was decided that this second line of analysis should be treated separately.

As regards the geographical composition of the sample, 14 respondents were from North America, 11 from Western European countries, 5 from Japan and 4 from Asia. The companies in the sample represent a variety of business models and invest in different sub-sectors. The respondents were asked to indicate in which sectors they primarily invested: multiple answers were possible because several companies are producers of both software and hardware. Chart 16 reproduces the finding on a scale of 1 to 10: the sectors in which most companies invested were software and hardware and components, followed by IT services. Only a minority invested in other sub-sectors.

Chart 16
Sectors in which the companies invest



Scale: 1 to 10.

It is interesting to note that the companies which indicated that they invested primarily in hardware and components had an average turnover of \$ 18.82 billion, while those that invested primarily in software had an average turnover of \$ 4.28 billion. In other words, many of the “smaller” companies in our sample were mainly investing in software. This replicates the underlying structure of the industry: by way of comparison, the 12 largest companies in the field of computer hardware and office equipment, as reported by *Fortune magazine*, had an average turnover of \$ 21.3 billion, while the 13 largest software producers had an average turnover of \$ 4.3 billion.²⁴

2. Type of ownership arrangements

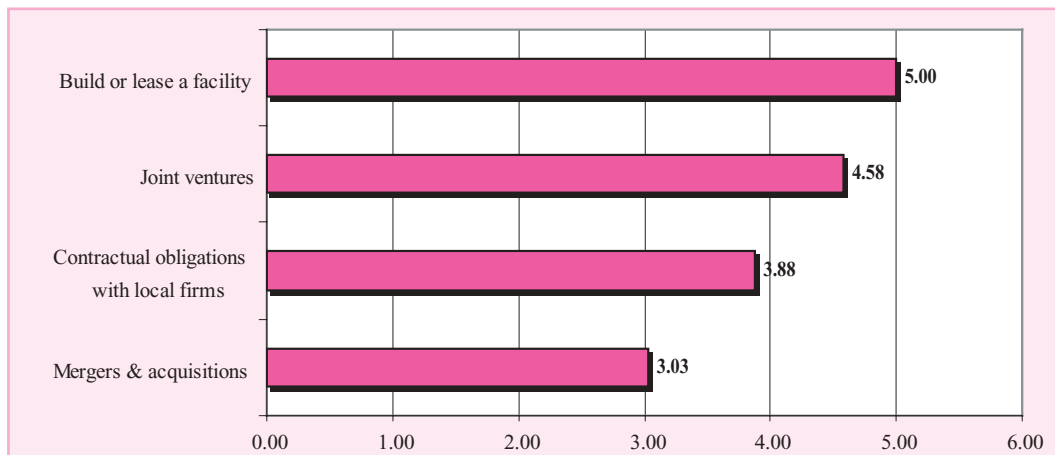
Respondents were asked to rank the means that their company used in order to establish a presence in

developing countries. Companies were given four choices, as set out in Chart 17.

The majority of respondents answered that investment was of the greenfield type (building or leasing a facility), while mergers and acquisitions were the least utilized among the available options. Interestingly, this is the reverse of the finding by the *World Investment Report*. “Over the past decade, most of the growth in international production has been via cross-border M&A rather than greenfield investment”.²⁵ The difference in conclusions may be explained by the fact that the corporate IT sector in developing countries has not yet presented advantageous acquisition targets or merger partners owing to the relative infancy of the entire IT sector.

Our finding could be related to the particular characteristics of the IT industry as opposed to other eco-

Chart 17
Means that your company uses in order to establish a presence in developing countries



Scale: 1 to 10.

conomic sectors. One should be careful, however, about potential definitional discrepancies. In particular, in our survey, greenfield investment was defined quite loosely to include building or leasing a facility. In other words, this answer could point to strikingly different patterns, such as building a new plant for the production of IT hardware or leasing an office for the distribution of a company's products.

Nevertheless, reading through the answers, and combining this answer with the one on the purpose of investment (see below), led to the conclusion that quite a number of the respondents were indeed undertaking greenfield investment with the intention of starting local production. The prevalence of greenfield investment is a positive sign, because it results in a net increase in the developing countries' production facilities, and can contribute to the overall improvement in macroeconomic and export trade performance.

Another important expansion tool, utilized extensively by the respondent companies, was the formation of joint ventures with local companies, whereby the multinational corporation is typically contributing its command of state-of-the-art technology and the local partner the knowledge of the market. In many cases, joint ventures are preferred to the alternative of directly acquiring local companies, because this strategy requires a lower upfront investment, and because continuity in the operations of local companies is preserved.

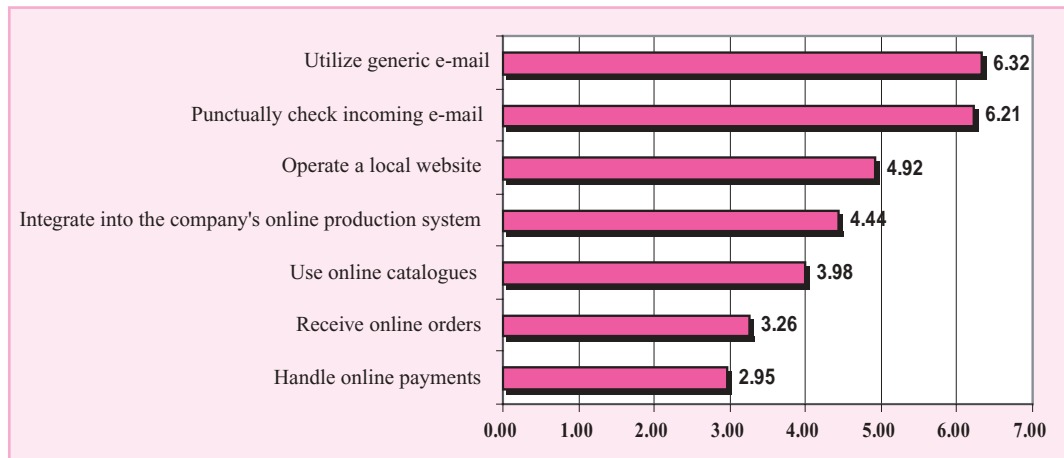
The relatively low number of companies that chose mergers and acquisitions as their preferred expansion tool could be due to a number of factors, including the fear that local companies may be burdened by debt or tied down by the composition of their workforce.²⁶

3. Utilization of e-commerce by IT multinationals

The respondents declared that – on average – 35 per cent of their purchases and 16 per cent of their sales were done over the net. Reliable statistics on enterprises' use of e-commerce are notoriously difficult to find,²⁷ and so it was not possible to compare this finding against other figures collected at the worldwide level, as would have been desirable. As a tentative comparison, in the United States, a recent survey by the United States Department of Commerce found that: "E-shipments account for 18.4 per cent of the value of all shipments from US manufacturing plants in 2000".²⁸ In account of the fact that our sample includes companies from countries that are less advanced in e-commerce than the United States, we can conclude that companies from the IT sector are – as would have to be expected – comparatively heavy users of electronic commerce.

In this light, it is interesting to see whether developing countries' operations are able to seamlessly integrate into the multinationals' system of production, which relies on high technology for the execution of contracts with established suppliers (see chart 18)

Chart 18
What proportion of your facilities in developing countries use the following technologies?



Scale: 1 to 10.

The respondents were asked what proportion of their developing countries' operations used common information and telecommunication technologies. On a scale of 1 to 10, 10 would represent an answer such as "all developing countries' facilities utilize the technology" and a value of 1 "none of the developing countries' facilities utilize it". As can be seen from chart 18, a large proportion of developing countries' facilities utilize e-mail and operate a website, but few of them are yet engaging in e-commerce operations such as managing online catalogues, receiving online orders and handling online payments, and more generally becoming integrated into the company's online production system.

It is perhaps for this reason that a rather high percentage of the respondents declared that the various aspects of e-commerce did not facilitate "at all" the setting up and operating of developing countries' facilities (9 per cent). An equal percentage of respondents held an opposite view – namely that e-commerce had greatly facilitated such operations – and the great majority of respondents thought that e-commerce had made things significantly (32 per cent) or somewhat (47 per cent) easier.²⁹ More research would have to be done to qualify this perception, but it appears that in the operation of overseas facilities the "handshake" and personal contacts still retain their importance in spite of technological advances and that developing countries' facilities continue to be managed utilizing ordinary telecommunications tools rather than the new technologies, in view in particular of the still limited availability of ICT in developing countries.

4. Location of investment

The respondents were asked to provide details of the regions where they invested or where they intended to invest in the near future, indicating for what purpose they were investing or were intending to invest there (Chart 19). In order to keep the design of the questions simple, the companies were offered six choices: Africa, Eastern Europe, Latin America, Middle East, South-East Asia (ASEAN countries) and other developing countries in Asia (including India and China). The majority of the respondents (70 per cent) indicated that they invested in "other developing countries in Asia", while a slightly lower percentage (67 per cent) in South-East Asia. These regions were followed at a distance by Eastern Europe and the Middle East, and then by Africa and Latin America.

Next, in view of this strong concentration of IT investment, which appears to be even more important than that encountered in many other industries, it becomes interesting to see what are the factors that draw investment to specific countries and what are the consequences of alternative policy actions that countries can take in this regard.

In the first place, as Chart 20 shows, the location of the investment was influenced by the location of the mother company's headquarters. On the Asian and Latin American markets, the bulk of the investment was from United States' firms, while in Eastern Europe it was from European companies. In the Afri-

can and Middle East markets the percentages of European and American companies were identical. A surprisingly high percentage of investment in Latin

America and the Middle East came from Japanese companies, and equally interesting was the involvement of Asian companies in the African market.

Chart 19

In which of the following regions does your company currently invest or intend to invest (percentages)?

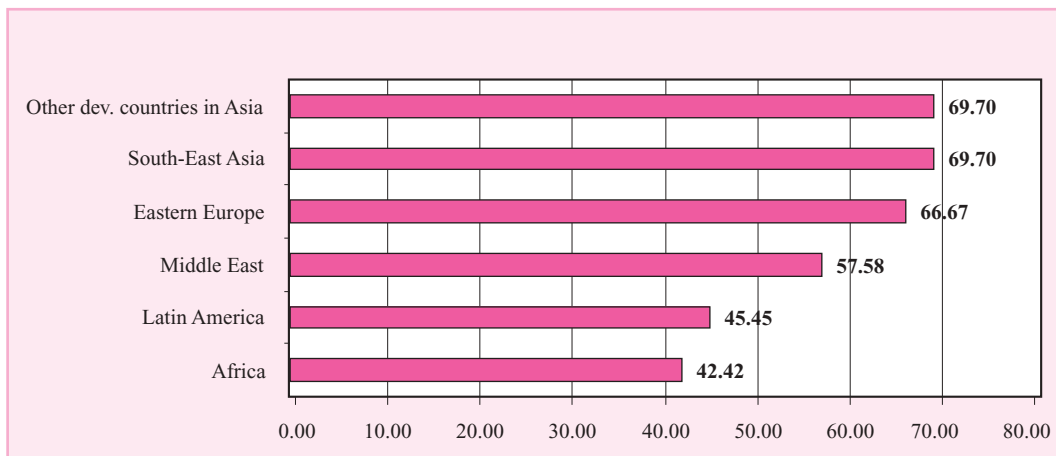
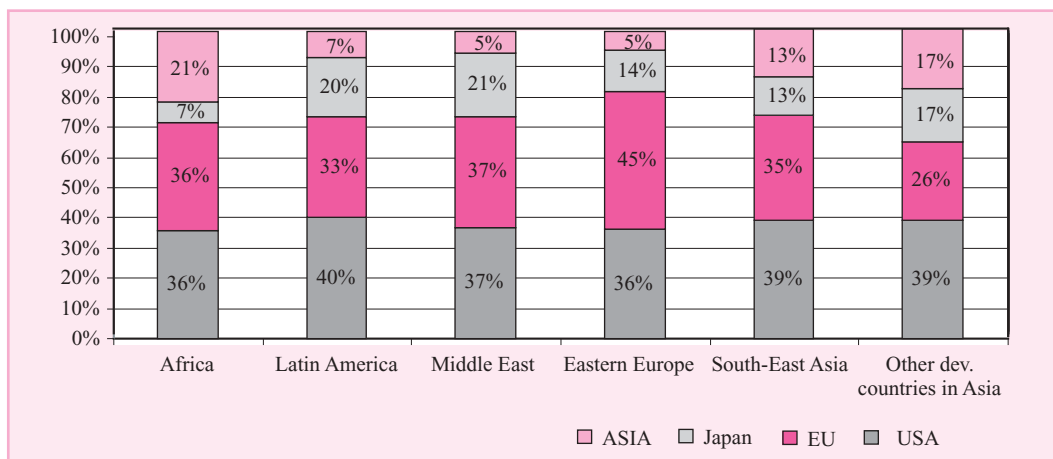


Chart 20

Percentage of companies that invest in the different regions according to the location of their headquarters

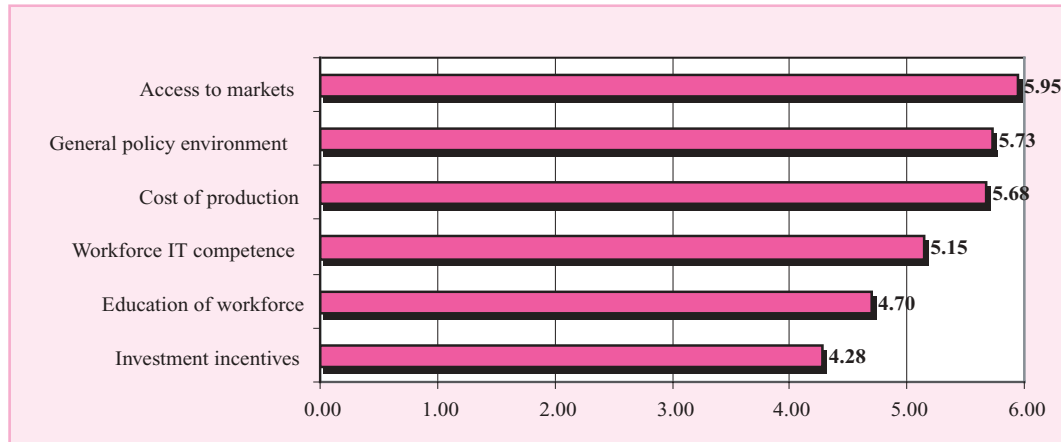


As for the other factors that directed IT investment to specific markets, the most important was access to markets (market size and potential, proximity to larger markets, participation in regional/bilateral free trade areas), followed by general policy environment (political stability, trade policy, tax policy), cost of production, workforce IT competence, workforce education and investment incentives (see chart 21).

This ranking basically reflects the findings of other surveys – see, for instance, the *Foreign Direct Investment Survey*³⁰ – but shows that IT companies attach particular importance to the competences of the workforce. The most important message from chart 20 is that IT multinationals will select the location of their subsidiaries according to fundamental macroeconomic variables, which the country can alter only in the medium

Chart 21

Factors that your company considers in choosing a developing country as a potential location for investment



Scale: 1 to 10

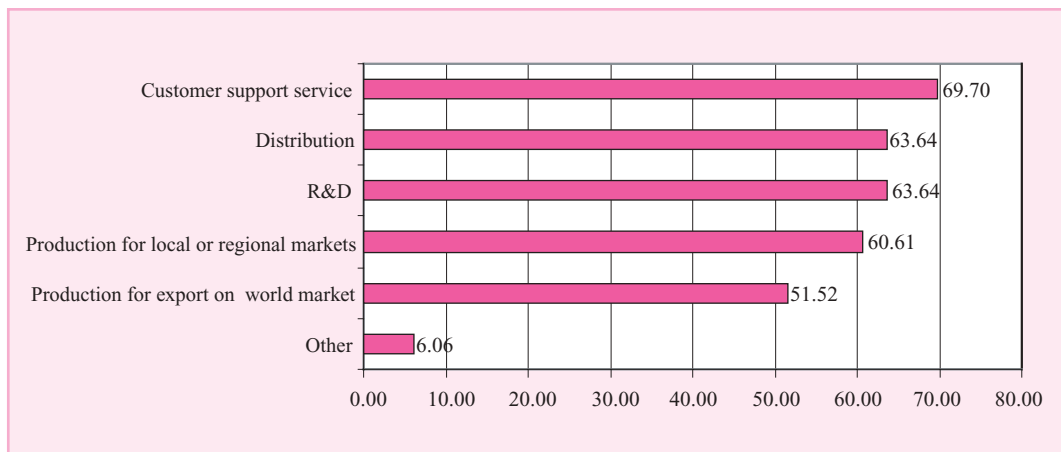
to long term. For instance, the most important factor in TNCs decisions appears to be “access to markets”: while access is a geographical factor over which the policy maker has little control, partially, it can be enhanced by signing free trade area agreements at the regional level and marketing the country as the potential production hub to service the regional market. The case is similar for factors such as “general policy environment” and “cost of production”: Governments can influence them by making the country an enabling environment for investment – both local and foreign – but clearly this can only be a long-term policy goal. Factors such as investment incentives, which can be altered in the short term, are instead likely to have less effect on companies’ decisions on the location of investment.

Next, it is interesting to analyze the purpose for which the respondent companies invest in developing regions (see chart 22). The questionnaire gave the companies five choices: Customer Support Service (CSS), Distribution, Production for export on the world markets, Production for local or regional markets, Research and development (R&D) and Other. The most important reason for investment in developing countries was customer support service and distribution, followed by R&D, and production.

Since customer support service and distribution are critical factors that draw IT investment to the different markets, it is safe to assume that IT multinationals will invest more heavily in the very regions in which they are more intensively exporting. Thus, as e-commerce

Chart 22

For what purpose does your company invest or intend to invest?(percentages)



and e-business lead the business sector in developing countries to make more intensive use of the new technologies, more IT investment will flow to those regions. The relative importance of customer support service also points to the growing market which tends to the needs of corporate clients for the customization of hardware and software and which – as was discussed in boxes 17 and 18 – also offers business opportunities for developing countries.

Chart 23 makes a cross-analysis of the reasons why multinationals invest in the different regions, accord-

ing to the purpose of investment. It appears quite clearly that investment in production facilities and in research and development – which is the one that most facilitates the transfer of technology from multinationals to local companies – is still heavily concentrated in South and South-East Asia. In fact, while R&D represents 20 per cent of all investment in those two regions, the percentage is only 6 per cent in the Middle East and 7 per cent in Africa. Similarly, investment in production facilities represents 37 per cent of total investment in South-East Asia and only 23 per cent of total investment in Africa.

Chart 23
Percentage of companies that invest in the different regions according to the purpose of investment



To summarize, the findings from the questionnaire point to an intensive concentration of IT investment in South and South-East Asia and in particular to the concentration of investment for productive and research purposes in those regions. Furthermore, it appears that government policies can only alter investment decisions on location in the medium to long term.

We turn now to the last set of questions, which focused on what actions Governments could take in order to maximize the positive fallback of IT investment, in terms of use of local labour by TNCs and enhancement of workforce skills and in terms of deepening the linkages between TNCs and the local industry.

5. Labour

A key benefit of FDI – and especially so in the field of IT – is the potential for human resources development. TNCs may in fact act as a powerful pull factor,

because they often offer better wages than domestic firms, but at the same time require a higher level of competence. As a result, they stimulate the development of a technically skilled workforce and encourage Governments and households to invest in education. In addition, the characteristics of jobs in TNCs are such that they often require on-the-job training so there TNC investment may have a direct impact on the qualifications of the workforce.

This brings us directly to the next question - how much of the employment generated by the multinationals is local. The respondent companies reported that – on average – local labour represented 79.7 per cent of the total workforce in their facilities in developing countries. The variation among companies was quite high for this answer, and over half of the companies in the sample reported percentages of 90 per cent and higher. It is also interesting to observe that the multinationals mostly employ skilled³¹ labour in their developing countries' facilities: in fact, it represented close to 69 per cent of the total workforce.

The respondents were then asked to specify which policy actions would be desirable in order to increase the number of high-skilled local personnel and improve their competencies (see chart 24).

The companies were of the view that the most important policy action in this regard was developing and expanding local universities, followed by increasing the quality and reach of primary education.

6. Subcontractors

One last important dimension that deserves to be explored is that of the linkages between multinationals and local industry.

The concept of "linkages" was the central theme in UNCTAD's *World Investment Report 2001*, which summarizes its benefits as follows:

"A key factor determining the benefits host countries can derive from FDI are the linkages that foreign affiliates strike with domestically owned firms. Backward linkages from foreign affiliates to domestic firms are important channels through which intangible and tangible assets can be passed on ...

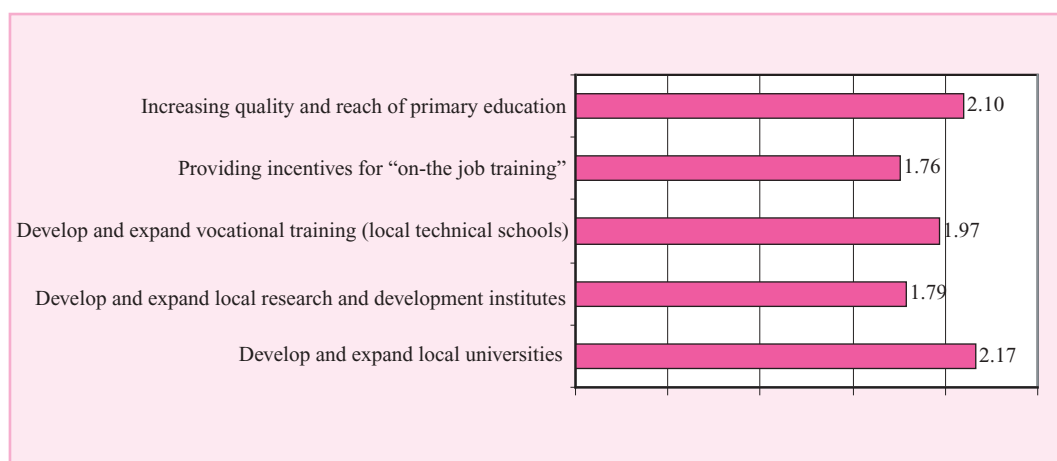
They can contribute to the upgrading of domestic enterprises, provide opportunities for production and employment by domestic suppliers and embed foreign firms more firmly in the host economies".³²

For these reasons, our survey included a question on the linkages that TNCs made with local firms. The companies that responded to our survey maintain intense linkages with local companies in the host countries. In particular, 65 per cent of companies indicated that they were buying generic office supplies from local firms and 56 per cent that they sourced from them direct inputs into the production process. Only 9 per cent of the firms declared that they did not rely on local partners.

Additionally, the respondents were asked to specify which policy actions would encourage them to make further use of local firms. As chart 25 shows, the most important ones are the strengthening of enforcement of contracts either by reinforcing local courts or through international investment agreements, developing the competencies of local firms in the field of IT, improving telecommunication infrastructure and improving information on the stability and financial security of local firms.

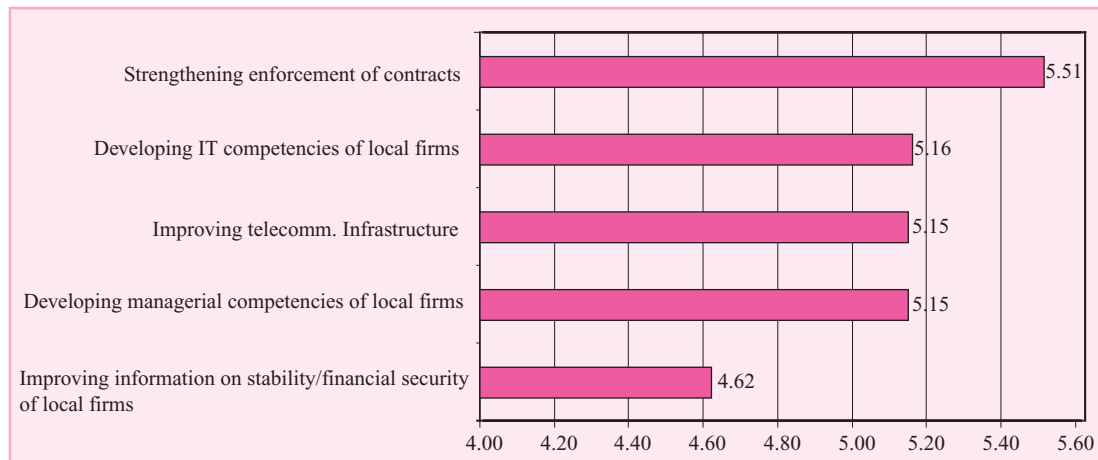
Chart 24

Actions that would help improving the competences of your company's local employees in developing countries



Scale: 1 to 10

Chart 25
Actions that would encourage you to increase your reliance on local subcontractors



Scale: 1 to 10

F. Conclusions

With regard to the question asked in the introduction to this chapter – that is, whether the IT industry, and more particularly investment by IT multinationals in developing countries, can contribute to enhancing a country's capacity to engage in e-business – the answer appears to be a qualified “yes”.

First, it appears from several of the answers in our survey that the TNCs that are investing in the IT sector in developing countries are doing so with a long-term objective. First, the very reasons why the TNCs choose the locations in which they invest have to do with complex, economic and geopolitical factors rather than short-term advantages. Moreover, an important part of the respondent companies reportedly chose 'greenfield' investment as a preferred expansion method, which is clearly a strategy that reflects an intention to create production capacity and establish a presence in the local markets of developing countries in the long term. Finally, the fact that the majority of the workforce employed in the production facilities of the TNCs is local labour, and especially skilled local labour, also shows a long-term commitment, in the light of the difficulty of hiring, training and retaining IT-savvy labour, especially in developing countries.

Second, IT investment in developing countries has a positive spillover effect on the local productive sector, which is significantly involved in the production proc-

ess of the multinationals. The companies also appear to focus on increasing the competences of their local workforce.

Third, the survey also reinforces the intuition that IT companies engage quite intensively in e-commerce, and that they equip many of their subsidiaries in developing countries with e-commerce functionalities. If that is so, IT investment might then make an important contribution to increasing e-commerce in those countries, at the same time boosting data traffic on the Internet, fuelling competition and hence potentially bringing about cost reductions in telecommunication services.

On the other hand, most of the IT companies indicated that the new technologies made only a partial contribution to the setting up and operation of developing countries' facilities. This suggests that developing countries' facilities continue to be managed utilizing ordinary telecommunications tools rather than the new technologies, in view in particular of the still limited availability of ICT in developing countries.

Furthermore, IT investment is still very concentrated in Asia and South-East Asia, even more so than other kinds of investment, which are more dependent on the availability of natural resources. It is also important to emphasize that investment for production and research purposes – which offers the best opportunities for transfer of technology – is even more heavily concentrated in these regions. It would therefore

appear that investment by IT multinationals could be used as a pull factor for the development of e-business only by some of the developing countries.

This finding is reinforced by the analysis of the factors that directed IT investment to specific markets, which reveals that policy incentives can alter multinationals' investment location decisions only in the medium to long term.

However, this picture could change in the coming years, as the new technologies become more widespread, fuelling demand for IT sales and investment in the developing countries. A potential role for the policy makers – in cooperation with the private sector and all the relevant stakeholders – will then be to foster an enabling environment for e-business through the adoption of national e-strategies. The specificities of the e-strategies will differ across countries and regions, but the analysis contained in this chapter highlights the importance of involving the local IT industry and the local branches of the IT multinationals in their definition and implementation.

Government policies might also play an important role in enhancing the positive impact of IT investment on workforce skills – by improving the reach and the quality of university programmes – and in deepening the linkages between the multinationals and the local business sector by strengthening the enforcement of contracts, developing IT competencies of local firms, and improving telecommunications infrastructure.

The industry includes a number of strikingly different economic sectors, some of which are particularly dynamic and were resilient to the recent economic downturn. The high growth of some segments of the industry, combined with the recent liberalization of the sector in the context of the WTO ITA Agreement, appears to provide IT companies from developing countries with important opportunities for exports.

The localization of existing software programs and the customization of IT systems for the benefit of the local business sector as well as for the multinationals that are present in the country, could also constitute an initial entry strategy for software companies of developing countries, which could then build up export capacity targeted at the regional markets. The fact that a large share of the multinationals' investment in the developing countries is directed to distribution and customer support services – which are a proxy for the customization of hardware and software products to the needs of corporate clients – is also indicative of the importance of this market and of its potential. It is important to underline that this strategy is on the borderline between IT production and IT use and as such it at the same time provides opportunities for local IT companies and enhances the local business sector's capacity to engage in e-commerce.

Our analysis also highlights the significant opportunities that may emerge from the development of open-source software and from the adaptation of existing technology to this new environment. In this regard, Governments can play an active role by ensuring that local businesses and the local IT industry can make their choices as regards systems infrastructures which best suits their needs with a full understanding of the issues at stake. Training programmes and the adaptation of university curricula might be needed to ensure that the local IT industry as well as the local business sector can take full advantage of these opportunities. In the dialogue that is taking place at the national and international levels among all the stakeholders involved in the definition of “e-strategies” for developing countries, these opportunities should be adequately addressed.

Notes

- 1 For a description of the products included in this study, see annex 1.
- 2 IDC (2001).
- 3 See IDC (2002): 'Worldwide IT spending growth, which was flat in 2001, is projected to rise to 4.7 per cent in 2002 and to 9.6 per cent in 2003'.
- 4 UNCTAD COMTRADE database.
- 5 Ibidem.
- 6 WTO (2002).
- 7 UNCTAD COMTRADE database.
- 8 See annex 1 for details of the product categories utilized in this study.
- 9 UNCTAD COMTRADE database.
- 10 UNCTAD COMTRADE database.
- 11 UNCTAD COMTRADE database
- 12 ITC (1999, p. 14).
- 13 ITC (1999, p. 52).
- 14 Ibid.
- 15 UNCTAD COMTRADE database.
- 16 ITC (1999, p. 34).
- 17 This problem is, for instance, particularly important for relays, switches, inductors and connectors, which may include some electrical products in addition to electronic ones.
- 18 For a detailed discussion of this trend see Kraemer and Dedrick (1999).
- 19 For an analysis of the impact of ICT on development see Bridges.org (2001), Digital Opportunity Initiative (2001), Department for International Development (DFID) (2002), Goldstein and O'Connor (2000), Kapur (2001), Open Economies Project (2002), UNCTAD (2000b), UNCTAD (2001b), UNCTAD (2002) and UNDP (2001).
- 20 For examples see UNCTAD (2001a), chapter 9, 'E-Commerce in the Least Developed Countries'.
- 21 See UNCTAD (2002). UNCTAD held an Expert Meeting on Electronic Commerce Strategies for Development, from 10 to 12 July 2002. The papers and the presentations from that meeting are available at <http://www.unctad.org/ecommerce>.
- 22 Including Fortune, Datamonitor and Piranhaweb.
- 23 Our estimate of worldwide IT spending includes telecommunication and scientific equipment, for which Fortune 500 does not provide a separate listing, so that the one-third ratio is an underestimate.
- 24 *Fortune magazine*, 15 April 2002, available at www.fortune.com
- 25 UNCTAD (2000a, p.10).
- 26 For an illustration of why M&As might be difficult in emerging markets, see *The Economist* (2002). The article, which notes that the Republic of Korea has many large companies that interest foreign investors, asks why they are so difficult to buy and gives illustrations of difficult negotiations in the field of IT and in other sectors. Apparently, the reasons for these difficulties have to do with local culture, lack of reliable financial information and debt. These problems are not specific to the Republic of Korea, but are illustrative of problems that are quite common in developing countries. Indeed, as reported by the *Wall Street Journal* of 8 May 2002, "Korean FDI in April surged 56.6 per cent from a year earlier".
- 27 For more information on the collection of statistics on e-commerce see UNCTAD (2001b).

- 28 United States Department of Commerce (2002).
- 29 Percentages do not add up owing to the fact that some companies did not respond.
- 30 Multilateral Investment Guarantee Agency (MIGA) (2002).
- 31 The companies were not given a definition of “skilled labour” but were left free to utilize their own definition. It is therefore quite possible that definitions varied across companies, but we preferred to keep the questions as simple as possible to minimize the work required of the respondents.
- 32 UNCTAD (2001a, p. 132).

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ANNEX I

STATISTICAL DATA ON THE IT SECTOR

The dataset utilized in the analysis of trade flows and tariffs was constructed using the United Nations COM-TRADE database and the UNCTAD TRAINS database, on the basis of a classification provided by ITC in the publication *Trade in Information Technology Products and the WTO Agreements* (ITC, 1999). This definition is close to – although not identical to – the product coverage of the WTO ITA Agreement. The reason for the discrepancy lies in the fact that the ITC definition utilizes Standard International Trade Classification (SITC) codes at the 4-digit-level, whereas in the Annex to the WTO Agreement the product coverage is defined in the Harmonized System (HS) at the 6-digit level.

It also should be noted that in the dataset on trade flows all countries that report data to the United Nations were included in the analysis. Because not all countries reported data for the three years that were included in the analysis, a different subset of reporting countries had to be utilized to cover the entire period.

Annex table 20 below provides a detailed listing of the product codes that were used in the analysis of trade flows and tariffs.

Table 20
Dataset utilized for analysis of trade in the IT sector

Products	SITC codes	Description
Semiconductors	7764, 7763	Discrete semiconductor devices and integrated semiconductor devices. Commonly, transistors, thyristors, diodes, hybrid circuits, microprocessors, memories, A to D and D to A converters, A to D amplifiers and a host of microchip components which form the building block of any electronic system.
EDP	7521, 7522, 7523, 7526, 7527, 7529, 7599	Large, medium and small-scale systems including input/output devices, storage devices and data communication equipment. In common parlance, personal computers, work stations, multi-user servers, keyboards, monitors, printers, modems, LAN cards, hubs, routers, serial and parallel ports, multi-media accessories, cables and other peripherals. Computer software: packaged software in diskettes, magnetic tapes and CD-ROM.
Office equipment	7511, 7512, 7633, 7513, 7591, 7638	Electronic typewriters, electronic calculators, electronic cash registers, electronic accounting machines, dictation equipment and photocopiers.
Telecom equipment	7643, 7641, 76491, 76481	Line telephony/telegraph transmission apparatus, radio telephony/telegraphy receiver, parts and accessories, switching equipment, fax machines, transmission equipment, telephone sets, other telecommunications equipment, accessories and parts.
Other components	7762, 7768, 7711, 7712, 7786, 7723, 7722, 7724, 7725, 7731, 8984	Color television tubes, monochrome television tubes, other display tubes, capacitors, resistors, connectors, plugs and sockets, electrical circuits, switches, transformers, chokes, coils and PCBs.
Other miscellaneous products	7788, 7648, 8743, 8744, 8747, 5985	Measuring and checking devices, chromatographs, spectrometers, optical radiation devices, and electrophoresis equipment and other miscellaneous equipment.

Source: ITC (1999, pp. 164-165).

ANNEX II

QUESTIONNAIRE ON ELECTRONIC COMMERCE AND INVESTMENT IN DEVELOPING COUNTRIES

The survey began with a selection of around 250-300 candidates drawn from databases from Fortune, Datamonitor and Piranhaweb. The questionnaire was sent by e-mail or fax to all these companies, and was then posted on the web to make it easier for the companies to respond. After an intense follow-up that lasted over two months during which the importance of the questionnaire was highlighted, 35 companies responded. The response rate – over 10 per cent – should be considered very satisfactory, since in this kind of questionnaire response rates typically range around 2-5 per cent. Following the survey, the results were uploaded in a database and responses from the companies aggregated to allow not only a simple analysis of answers given to specific questions but also cross-question aggregations.

The questionnaire

1. What is the percentage of your company's sales that take place electronically (i.e. customer's order is placed electronically)?

2. What is the percentage of your company's purchases that take place electronically (i.e. your order is placed electronically)?

3. Does your company currently invest or intend to invest in any of the following regions? For what purpose? Please mark with an x the corresponding cell in the table

	Production for export on world market	Production for local or regional markets	Distribution	R&D	Customer support service	Other (specify)
Africa						
Latin America						
Middle East						
Eastern Europe						
South-East Asia						
Other developing countries in Asia						

4. Within these regions, which country will be the top location of your investment in the coming two years?

5. Please rank from 1 to 4 the factors that your company considers in choosing a developing country as a potential location for investment (1= most important; 4= least important)

	Rank
Develop and expand local universities	
Develop and expand local R&D institutes	
Develop and expand vocational training (local technical schools)	
Providing incentives for "on-the job training"	
Increasing quality and reach of primary education	

6. Please rank from 1 to 4 the sectors in which your company primarily invests (1 = most important; 4 = least important)

Hardware and components	Software	IT Services	Other
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Please rank from 1 to 4 the means your company uses in order to establish a presence in developing countries (1 = most common; 4 = least common):

Build/lease a facility	Mergers & acquisitions	Joint ventures	Contractual with local firms
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. In your company's facilities in developing countries, on average, what is the percentage of local labour in the total workforce?
- _____

9. In your company's facilities in developing countries, on average, what is the percentage of skilled labour in the total workforce?
- _____

10. Please rank from 1 to 4 the actions that would help improve the competences of your company's local employees in developing countries (1 = most important; 4 = least important)

	Rank
Develop and expand local universities	
Develop and expand local R&D institutes	
Develop and expand vocational training (local technical schools)	
Providing incentives for "on-the job training"	
Increasing quality and reach of primary education	

11. When investing in developing countries does your company rely on local partners:

For production don't rely of inputs	For generic office supplies	For other purposes	No, we on local partners
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Please rank from 1 to 4 the actions that would encourage you to increase your reliance on local subcontractors (1 = most important; 4 = least important):

	Rank
Improving telecommunications infrastructure	
Developing IT competencies of local firms	
Developing managerial competencies of local firms	
Improving information on stability/financial security of local firms	
Strengthening enforcement of contracts by local courts/international agreements	

13. Do different aspects of “electronic comerce” facilitate the setting-up and the operation of your facilities in developing countries:

To a great extent	Significantly	Somewhat	Not at all
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. What proportion of your facilities in developing countries use the following technologies: (1= all of them; 4 = none of them):

	Rank
Utilize generic e-mail	
Punctually check incoming e-mail	
Operate a local website	
Use online catalogues	
Receive online orders	
Handle online payments	
Integrate into the company's online production system	

Company name

Total turnover from IT products (Thousand US \$)

Contact person

E-mail address.....